B.S. Abdur Rahman

Crescent
Institute of Science & Technology
Deemed to be University u/s 3 of the UGC Act, 1956

Regulations 2021
Curriculum and
Syllabi (I – IV semesters)
(Amendments updated upto February 2022)

B.Tech.
(Civil Engineering)

REGULATIONS 2021

CURRICULUM AND SYLLABI (I – IV Semesters)

(Amendments updated upto February 2022)

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

VISION AND MISSION

Vision

- To be a leading department for Education, Training and Research in Civil Engineering for a better future and over-all 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.
- To educate our students on design, construction, maintenance and advancements in civil engineering for providing solutions to the betterment of the society.
- To prepare competitive and responsible citizens with good communication, leadership and managerial skills.
- To enrich and enhance the knowledge base for the best practices in various areas of Civil & allied Engineering through collaborations with Global Institutions of Excellence, Industries and Research Organizations.
- To provide a healthy ambience for teaching, research, consultancy and extension activities.

PROGRAMME EDUCATIONAL OBJECTIVES

- To provide fundamental knowledge in science and mathematics to understand civil engineering concepts.
- To equip with knowledge to plan, design, analyze, construct, maintain and manage civil engineering systems.
- To provide understanding of various codes and standards in the field of design and construction.
- To impart knowledge in theory and skills in practice on structural, geo-technical, geo-informatics, water resources, environmental and transportation engineering in solving civil engineering problems.
- To inculcate knowledge of sustainability in various aspects of civil engineering.
- To provide broad exposure on managerial, economic and ethical issues.

PROGRAMME OUTCOMES

On successful completion of the programme, the graduates will be able to

- Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- Identify, formulate, research literature, and analyses complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- Use research –based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

- Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

- Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

- Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

- Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

- Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

- Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

- Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

- Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES

- Identify suitable construction materials, techniques and practices for Civil Engineering construction.
- Plan, analyze, design and estimate civil engineering structures using relevant software and appropriate codal provisions.
- Characterize water & wastewater and design sustainable water supply & sanitation schemes.

REGULATIONS - 2021
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 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.

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.

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. 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.

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. Electrical and Electronics Engineering
10. Electronics and Communication Engineering
11. Electronics and Instrumentation Engineering
12. Information Technology
13. Mechanical Engineering
14. Polymer Engineering

4.0 STRUCTURE OF THE PROGRAMME

4.1 Every programme has a curriculum with syllabi consisting of theory and practical courses 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 Courses- MC
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:

- 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 20% 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 valued 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 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.

4.5 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 a Course

A student can change an enrolled 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 classes, student representatives and a senior faculty member not handling the courses 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 32 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 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. 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.

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

In the case of project work, a committee of faculty members constituted by the Head of the Department / Dean of the School will carry out three periodic reviews. Based on the project report submitted by the students, an oral examination (viva voce) shall be conducted as semester end examination by an external examiner approved by the Controller of Examinations. The weightage for periodic reviews shall be 50%. Of the remaining 50%, 20% shall be for the project report and 30% for the viva voce examination.

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 contact periods of every course, subject to a maximum relaxation of 25% to become eligible to appear for the semester end examination in that course, failing which the student shall be awarded "I" grade in that 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 secures attendance between 65% and less than 75% in any course in a semester, due to medical reasons (hospitalization / accident / specific illness) or due to participation in the institution approved events, the student shall be given exemption from the prescribed attendance requirement and the student shall be permitted to appear for the semester end examination of that course. In all such cases, the students shall submit the required documents immediately after joining the classes to the class advisor, which shall be approved by the Head of the Department / Dean of the School. The Vice Chancellor, based on the recommendation of the Dean (Academic Affairs) may approve the condonation of attendance.

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 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.

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	-

"W" - denotes withdrawal from the course

"I" - denotes inadequate attendance in the course and prevention from appearance of semester end examination

"U" - denotes unsuccessful performance in the course.

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 ith course and GP_i is the Grade Point in the ith course,

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

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" and "W" grades are excluded for calculating GPA.

"U", "I" and **"W"** 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. This committee shall also address the grievances related to the conduct of online classes.

19.0 ELIGIBILITY FOR THE AWARD OF DEGREE

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

i) 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.

ii) Successfully completed the requirements of the enrolled professional development activity.

iii) No dues to the Institution, Library, Hostel, etc.

iv) No disciplinary action pending against him/her.

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

20.0 MINOR DEGREE PROGRAMMES OFFERED FOR STUDENTS

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

• Civil Engineering	• Mechanical Engineering
• Electronics and Communication Engineering	• Electrical and Electronics Engineering
• Automobile Engineering	• Aeronautical Engineering
• Polymer Engineering	• Biotechnology Engineering
• Electronics and Instrumentation Engineering	• Computer Science and Engineering
• Information Technology	• Artificial Intelligence and Data Science
• Computer Science and Engineering (IoT)	• Computer Science and Engineering(Cyber Security)

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

Sl. No.	Minor Degree	Eligible Major Degree Programmes (from other Departments)
1.	Artificial Intelligence and Machine Learning	Mechanical Engineering
2.	Block Chain	Aeronautical Engineering
3.	Cyber Security	Polymer Engineering
4.	Data Science	Automobile Engineering
5.	Internet of Things (IoT)	Civil Engineering
		Biotechnology
		Electrical and Electronics Engineering
		Electronics and Instrumentation Engineering
6.	Virtual and Augmented Reality	Mechanical Engineering
		Aeronautical Engineering
		Polymer Engineering
		Automobile Engineering
		Civil Engineering
		Biotechnology
		Electrical and Electronics Engineering
		Electronics and Instrumentation Engineering
		Electronics and Communication Engineering

7.	Sensor Technology	Mechanical Engineering
		Aeronautical Engineering
		Polymer Engineering
		Automobile Engineering
		Civil Engineering
		Biotechnology
		Electrical and Electronics Engineering
8.	Robotics	Artificial Intelligence and Data Science
		Computer Science and Engineering (Cyber Security)
		Computer Science and Engineering (IoT)
		Computer Science and Engineering
		Information and Technology
		Civil Engineering
		Biotechnology
		Electrical and Electronics Engineering
		Electronics and Instrumentation Engineering
9.	3D Printing	Artificial Intelligence and Data Science
		Computer Science and Engineering (Cyber Security)
		Computer Science and Engineering (IoT)
		Computer Science and Engineering
		Information and Technology
		Biotechnology
		Electrical and Electronics Engineering
		Electronics and Instrumentation Engineering
		Electronics and Communication Engineering
10.	Electric Vehicles	Artificial Intelligence and Data Science
		Computer Science and Engineering (Cyber Security)
		Computer Science and Engineering (IoT)
		Computer Science and Engineering
		Information and Technology
		Civil Engineering
		Biotechnology
		Electronics and Communication Engineering
11.	Industrial Automation	Artificial Intelligence and Data Science
		Computer Science and Engineering (Cyber Security)

		Computer Science and Engineering (IoT)
		Computer Science and Engineering
		Information and Technology
		Mechanical Engineering
		Aeronautical Engineering
		Polymer Engineering
		Automobile Engineering
		Civil Engineering
		Biotechnology
		Electronics and Communication Engineering
12.	GIS and Remote Sensing	Artificial Intelligence and Data Science
		Computer Science and Engineering (Cyber Security)
		Computer Science and Engineering (IoT)
		Computer Science and Engineering
		Information and Technology
		Mechanical Engineering
		Aeronautical Engineering
		Polymer Engineering
		Automobile Engineering
		Biotechnology
		Electrical and Electronics Engineering
		Electronics and Instrumentation Engineering
		Electronics and Communication Engineering
13.	Computational Biology	Artificial Intelligence and Data Science
		Computer Science and Engineering (Cyber Security)
		Computer Science and Engineering (IoT)
		Computer Science and Engineering
		Information and Technology
		Mechanical Engineering
		Aeronautical Engineering
		Polymer Engineering
		Automobile Engineering
		Civil Engineering
		Electrical and Electronics Engineering
		Electronics and Instrumentation Engineering
		Electronics and Communication Engineering

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

20.4 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.

21.0 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 FRAMEWORK, REGULATIONS 2021
(Choice Based Credit System)

SEMESTER I

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	BSC	PHD 1183	Mechanics of Solids *	3	0	2	4
2.	BSC	CHD 1181	Engineering Materials and Applications *	3	0	2	4
3.	BSC	MAD 1181	Algebra and Differential Calculus	3	1	0	4
4.	ESC	GED 1101	Engineering Graphics	2	0	2	3
5.	ESC	GED 1102	Engineering Design	2	0	0	2
6.	ESC	GED 1103	Manufacturing Practices Laboratory	0	0	2	1
7.	ESC	GED 1104	Programming for Problem Solving **	1	0	2	2
			Credits				**20 #**

SEMESTER II

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	HSC	END 1281	English for Engineers	3	0	0	3
2.	BSC	MAD 1281	Advanced Calculus	3	1	0	4
3.	ESC	GED1202	Basic Electrical and Electronics Engineering *	3	0	2	4
4.	ESC	GED 1201	Engineering Mechanics	3	1	0	4
5.	PCC	CED 1201	Building Constructionand Practices *	2	0	2	3
6.	PCC	CED 1202	Surveying *	3	0	2	4
7.	PCC	CED 1203	Civil Engineering Drawing **	0	0	2	1
8.	MC	GED 1206	Environmental Sciences	2	0	0	2
			Credits				**25**

SEMESTER III

SI. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	HSC		Humanities Elective I	3	0	0	3
2.	BSC	MAD 2183	Numerical Methods for Integral and Differential Equations	2	0	0	2
3.	PCC	CED 2101	Mechanics of Structures	3	0	0	3
4.	PCC	CED 2102	Mechanics of Fluids	3	0	0	3
5.	PCC	CED 2103	Concrete Technology	3	0	0	3
6.	PCC	CED 2104	Water and Waste Water Engineering *	3	0	2	4
7.	PCC	CED 2105	Transportation Engineering	3	0	0	3
8	PCC	CED 2106	Concrete and Highway Laboratory	0	0	2	1
9.	HSC	GED 2101	Essential Skills and Aptitude for Engineers	0	0	2	1
			Credits				**23**

SEMESTER IV

SI. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PCC	CED 2201	Mechanics of Soils *	3	0	2	4
2.	PCC	CED 2202	Structural Analysis I	3	0	0	3
3.	PCC	CED 2203	Structural Concrete Design *	3	0	2	4
4.	PCC	CED 2204	Estimation and costing of Infrastructure Projects	2	0	2	3
5.	PCC	CED 2205	Water Resources Engineering	3	0	0	3
6.	PCC	CED 2206	Survey and Soil Investigation Camp	0	0	2	1
7.	PEC		Professional Elective Courses	3	0	0	3
8.	HSC	GED 2201	Workplace Skills and Aptitude for Engineers	0	0	2	1
9.	MC	GED 2202	Indian Constitution and Human Rights	2	0	0	0
			Credits				**22**

SEMESTER V

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	HSC	MSD 3281	Entrepreneurship	3	0	0	3
2.	PCC	CED 3101	Structural Analysis II	3	0	0	3
3.	PCC	CED 3102	Design of Substructures	3	0	0	3
4.	PCC	CED 3103	Hydraulic and Hydraulic Machinery *	3	0	2	4
5.	PCC	CED 3104	Repair and Rehabilitation of RC Elements	3	0	0	3
6.	PCC	CED 3105	GIS and its Applications *	2	0	2	3
7.	PEC		Professional Elective Courses				3
8.	HSC	GED 3101	Communication Skills for Career Success	0	0	2	1
9.	PROJ	CED 3106	Internship I ##	0	0	0	1
			Credits				**24**

SEMESTER VI

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	BSC		Physics Elective	2	0	0	2
2.	BSC		Chemistry Elective	2	0	0	2
3.	HSC		Humanities Elective II	2	0	0	2
4.	OEC		Open Elective I	3	0	0	3
5.	PCC	CED 3201	Design of Structural Steel Elements	3	0	0	3
6.	PCC	CED 3202	Construction Management	3	0	0	3
7.	PEC		Professional Elective Courses				6
8.	HSC	GED 3201	Reasoning and Aptitude for Engineers	0	0	2	1
09	PCC		Value added course (mandatory non credit course)	2	0	0	0
			Credits				**22**

SEMESTER VII

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	OEC		Open Elective II				3
2.	OEC		Open Elective III				3
3.	PCC	CED 4101	Smart Infrastructure				3
4.	PEC		Professional Elective Courses				12
5.	PROJ	CED 4102	Internship II ###				1
6.	HSC	GED 4101	Employability Skills $	0	0	2	1
7.	PCC		Value added course (mandatory non credit course)	2	0	0	0
			Credits				**22**

SEMESTER VIII

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PROJ	CED 4201	Project Work				9
			Credits				**9**

Overall Total Credits – 167

* Laboratory Integrated Theory course
** Laboratory Course
# Three Week Orientation Programme – Mandatory Non-Credit Course
15 days of Industrial training during the summer vacation of second year. The credit will be awarded in the 5th Semester.
15 days of Industrial training during the summer vacation of third year. The credit will be awarded in the 7th Semester.
$ Not a Mandatory Course - The student will take up this course during the Summer Holidays of III year as a comprehension of Soft Skills courses offered from semester III to VI. Upon successful completion, the course will be mentioned in grade sheet of VII semester.

LIST OF PROFESSIONAL ELECTIVE COURSES

SPECIALIZATION I: STRUCTURAL ENGINEERING

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE	CEDX 01	Advanced Design of RC and Masonry Structures	3	0	0	3
2.	PE	CEDX 02	Advanced Design of Steel Structures	3	0	0	3
3.	PE	CEDX 03	Design of Bridge Structures	3	0	0	3
4.	PE	CEDX 04	Earthquake Resistant Design of Structures	3	0	0	3
5.	PE	CEDX 05	Introduction to Finite Element Analysis of Structures	2	0	2	3
6.	PE	CEDX 06	Structural Dynamics	3	0	0	3
7.	PE	CEDX 07	Prestressed Concrete Structures	3	0	0	3
8.	PE	CEDX 08	Prefabricated Structures	3	0	0	3
9.	PE	CEDX 09	Introduction to Steel-Concrete Composite Structures	3	0	0	3

SPECIALIZATION II: CONSTRUCTION TECHNOLOGY & MANAGEMENT

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE	CEDX 16	Advanced Concrete Technology	3	0	0	3
2.	PE	CEDX 17	Waterproofing of Concrete and Masonry Structures	3	0	0	3
3.	PE	CEDX 18	Corrosion Prevention and Control in RC Structures	3	0	0	3
4.	PE	CEDX 19	Lean Construction	3	0	0	3

5.	PE	CEDX 20	Intelligent Building Management System	3	0	0	3
6.	PE	CEDX 21	Automation in Construction and Management	3	0	0	3
7.	PE	CEDX 22	Building Information Modelling	1	0	4	3
8.	PE	CEDX 23	Housing Planning and byelaws	3	0	0	3

SPECIALIZATION III: GEOTECHNICAL ENGINEERING

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE	CEDX 31	Engineering Geology	3	0	0	3
2.	PE	CEDX 32	Ground Improvement Techniques	3	0	0	3
3.	PE	CEDX 33	Subsurface Investigation and Report Writing	3	0	0	3
4.	PE	CEDX 34	Applications of software in Geotechnical Engineering	3	0	0	3
5.	PE	CEDX 35	Geo-Environmental Engineering	3	0	0	3
6.	PE	CEDX 36	Pavement Engineering	3	0	0	3
7.	PE	CEDX 37	Geo Synthetics	3	0	0	3
8.	PE	CEDX 38	Design Principles of Special foundation	3	0	0	3

SPECIALIZATION IV: ENVIRONMENTAL ENGINEERING

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE	CEDX 41	Air and Noise Pollution Control	3	0	0	3

2.	PE	CEDX 42	Solid Waste Management	3	0	0	3
3.	PE	CEDX 43	Industrial Waste Water Treatment	3	0	0	3
4.	PE	CEDX 44	Hazardous Waste Management	3	0	0	3
5.	PE	CEDX 45	Environmental Risk Assessment	3	0	0	3
6.	PE	CEDX 46	Environmental Impact Assessment	3	0	0	3
7.	PE	CEDX 47	Sustainable Water and Sanitation for Smart cities	3	0	0	3

SPECIALIZATION V: HYDROLOGY AND WATER RESOURCES ENGINEERING

Sl.No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE	CEDX 51	Hydrology	3	0	0	3
2.	PE	CEDX 52	Ground Water Engineering	3	0	0	3
3.	PE	CEDX 53	Storm Water and Flood Management	3	0	0	3
4.	PE	CEDX 54	Design of Hydraulic Structures	2	0	2	3
5.	PE	CEDX 55	Water Power Engineering	3	0	0	3
6.	PE	CEDX 56	Water Distribution Systems	3	0	0	3

SPECIALIZATION VI: TRANSPORTATION ENGINEERING

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE	CEDX 61	Traffic Engineering	3	0	0	3
2.	PE	CEDX 62	Urban Planning and Design	3	0	0	3

3.	PE	CEDX 63	Intelligent Transportation Systems	3	0	0	3
4.	PE	CEDX 64	Pavement Design	3	0	0	3
5.	PE	CEDX 65	Railway Engineering	2	0	0	2
6.	PE	CEDX 66	Airport planning and Engineering	2	0	0	2
7.	PE	CEDX 67	Docks and Harbour Engineering	1	0	0	1

SPECIALIZATION VII: SURVEYING & ARCHITECTURE

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE	CEDX 71	GPS and Drone Surveying	3	0	0	3
2.	PE	CEDX 72	Remote Sensing	3	0	0	3
3.	PE	CEDX 73	Spatial Data Modelling and Analysis	3	0	0	3
4.	PE	CEDX 74	Principles of Architecture	3	0	0	3
5.	PE	CEDX 75	Islamic Architecture	3	0	0	3
6.	PE	CEDX 76	Vastu Sastra and Architectural Design	3	0	0	3

HUMANITIES ELECTIVES – III Semester

Sl. No.	Course Code	Course Title	L	T	P	C
1	SSDX 01	Engineering Economics and Management	3	0	0	3
2	SSDX 02	Sociology of Science and Technology	3	0	0	3
3	SSDX 03	Industrial Economics and Management	3	0	0	3
4	SSDX 04	Dynamics of Indian Social Structure	3	0	0	3

HUMANITIES ELECTIVES – VI Semester

Sl. No.	Course Code	Course Title	L	T	P	C
1	SSDX 11	Economics of Sustainable Development	2	0	0	2
2	SSDX 12	Sociology of Industrial Relations.	2	0	0	2
3	SSDX 13	Professional Ethics and Human Values	2	0	0	2
4	SSDX 14	Gender, Technology and Development	2	0	0	2

PHYSICS ELECTIVES – VI Semester

Sl. No.	Course Code	Course Title	L	T	P	C
1	PHDX 01	Non Destructive Testing of Materials	2	0	0	2
2	PHDX 02	Materials Science for Engineering	2	0	0	2
3	PHDX 03	Biomaterials	2	0	0	2
4	PHDX 04	Optical Fibre Communication	2	0	0	2
5	PHDX 05	Semiconductor Physics for Information Technology	2	0	0	2
6	PHDX 06	Sensors and Actuators	2	0	0	2
7	PHDX 07	Fundamentals of Nanotechnology and its Applications	2	0	0	2

CHEMISTRY ELECTIVES – VI Semester

Sl. No.	Course Code	Course Title	L	T	P	C
1	CHDX 01	Chemistry of Construction Materials	2	0	0	2
2	CHDX 02	Chemistry of Materials and Electrochemical Devices	2	0	0	2
3	CHDX 03	Chemistry and Instrumentation for Electrical And Electronic Applications	2	0	0	2
4	CHDX 04	Functional Materials and Applications	2	0	0	2
5	CHDX 05	Chemistry of Fuels, Combustion and	2	0	0	2

| 6 | CHDX 06 | Instrumental Methods of Polymer Analysis | 2 | 0 | 0 | 2 |
| 7 | CHDX 07 | Medicinal Chemistry | 2 | 0 | 0 | 2 |

OPEN ELECTIVE COURSES FOR
B.TECH. PROGRAMMES R 2021 - VI SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	C	Offering Department
1	GEDX 201	Application of Fluid Mechanics in Everyday Life	3	0	0	3	Aero
2	GEDX 202	Basics of Management and Organizational Behaviour	3	0	0	3	CSB
3	GEDX 203	Big Data Analytics	3	0	0	3	CA
4	GEDX 204	Biology for Engineers	3	0	0	3	SLS
5	GEDX 205	Consumer Electronics	3	0	0	3	ECE
6	GEDX 206	Creative Writing	2	1	0	3	English
7	GEDX 207	Cyber Forensics	3	0	0	3	CSE
8	GEDX 208	Cyber Security	3	0	0	3	IT
9	GEDX 209	Disaster Management	3	0	0	3	Civil
10	GEDX 210	English for Competitive Examination	2	1	0	3	English
11	GEDX 211	Enterprise Risk Management	3	0	0	3	CSB
12	GEDX 212	Fundamentals of Project Management	3	0	0	3	CSB
13	GEDX 213	Industrial Robotics	2	0	2	3	Mech.
14	GEDX 214	Internet of Things and its Applications	3	0	0	3	ECE
15	GEDX 215	Introduction to Health Care Analytics	3	0	0	3	CA
16	GEDX 216	IPR and Patent Laws	3	0	0	3	CSB
17	GEDX 217	Logistics and Supply Chain Management	3	0	0	3	CSB
18	GEDX 218	Nano Materials and Technology	2	0	2	3	Physics / Chemistry
19	GEDX 219	Numerical Computational Tools for Engineers	2	0	2	3	EIE

20	GEDX 220	Optimization Techniques	3	0	0	3	EEE
21	GEDX 221	Polymers for Emerging Technologies	3	0	0	3	Polymer
22	GEDX 222	Programming Language Principles	3	0	0	3	CSE
23	GEDX 223	Public Speaking and Rhetoric	2	1	0	3	English
24	GEDX 224	Python Programming	2	0	2	3	IT
25	GEDX 225	R Programming	3	0	0	3	CA
26	GEDX 226	Smart Sensors for Healthcare Applications	3	0	0	3	EIE
27	GEDX 227	Total Quality Management	3	0	0	3	Mech.
28	GEDX 228	Value Education	3	0	0	3	Commerce
29	GEDX 229	Waste Water Management	3	0	0	3	Civil
30	GEDX 230	Web Application Development	3	0	0	3	CA

OPEN ELECTIVE COURSES FOR
B.TECH. PROGRAMMES R 2021 - VII SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	C	Offering Department
1	GEDX 101	Advanced Entrepreneurship	3	0	0	3	CSB
2	GEDX 102	Artificial Intelligence and Machine Learning Applications	3	0	0	3	CSE
3	GEDX 103	Automotive Technology	3	0	0	3	Automobile
4	GEDX 104	Behavioural Psychology	3	0	0	3	SSSH
5	GEDX 105	Building Repair Solutions	3	0	0	3	Civil
6	GEDX 106	Cloud Services and Management	3	0	0	3	CA
7	GEDX 107	Cost Management for Engineers	3	0	0	3	Commerce
8	GEDX 108	Cyber Law and Ethics	3	0	0	3	CSL
9	GEDX 109	Data Analytics and Visualization	3	0	0	3	CA
10	GEDX 110	Deep Learning Essentials	3	0	0	3	CSE
11	GEDX 111	Drone Technologies	2	0	2	3	Aero
12	GEDX 112	Electric Vehicle	3	0	0	3	EEE

13	GEDX 113	Emerging Technologies in Mobile Networks	3	0	0	3	ECE
14	GEDX 114	Fundamentals of Data Science and Machine Learning	3	0	0	3	IT
15	GEDX 115	Genetic Engineering	3	0	0	3	SLS
16	GEDX 116	Green Design and Sustainability	3	0	0	3	Civil
17	GEDX 117	Image Processing and its Applications	3	0	0	3	ECE
18	GEDX 118	Industrial Automation and Control	3	0	0	3	EIE
19	GEDX 119	Industrial Safety	3	0	0	3	Mech.
20	GEDX 120	Industry 4.0	3	0	0	3	Mech.
21	GEDX 121	Introduction to Artificial Intelligence	3	0	0	3	IT
22	GEDX 122	Introduction to Artificial Intelligence and Evolutionary Computing	3	0	0	3	EEE
23	GEDX 123	Motor Vehicle Act and Loss Assessment	3	0	0	3	Automobile
24	GEDX 124	National Service Scheme	3	0	0	3	SSSH
25	GEDX 125	National Cadet Corps	3	0	0	3	SSSH
26	GEDX 126	Personal Finance and Investment	3	0	0	3	Commerce
27	GEDX 127	Soft Computing Techniques	3	0	0	3	CSE
28	GEDX 128	Value Analysis and Engineering	3	0	0	3	Mech.
29	GEDX 129	Vehicle Maintenance	3	0	0	3	Automobile

SEMESTER I

PHD 1183	MECHANICS OF SOLIDS	L	T	P	C
SDG: 4	(For Civil Engineering)	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 and stresses and deformation in circular and hallow shafts.

COB4: concept of stresses in thin cylinders and spheres with its application.

COB5: concept of stresses and strains in thick cylinders

MODULE I   PROPERTIES OF MATERIALS   9

Introduction – stress - Types of stress – strain – Types of strain – Poisson's ratio –Hooke's Law - Elastic constants and their relationship - Volumetric Strain - Plastic deformation of metals; Tensile test – standards for different material (brittle, quasi-brittle, elastic and ductile) - True stress – strain interpretation of tensile test; and hardness of materials;

**MODULE II   SIMPLE & COMPOUND STRESSES AND   9
                         STRAINS**

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   9

Theory of simple torsion – Stresses and deformation in circular and hollow shafts – Stepped shafts – Shafts fixed at both ends – Stresses and deflection of Leaf springs and helical springs.

MODULE IV   THIN CYLINDERS AND SPHERES   9

Thin Cylinders and Spheres- Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.

MODULE V   THICK CYLINDERS   9

Stresses in Thick cylinders subjected to internal and external pressure and compound cylinders - Stresses and strains in thick spherical shell.

PRACTICALS

1. Properties of steel rebar by tension test
2. Determination of hardness of metal by Rockwell and Brinell hardness test.
3. Determination of impact strength of metal by Izod and Charpy method.
4. Investigation of Hooke's Law using timber and steel.
5. Determination of Stiffness and Modulus of rigidity of steel specimen by torsion test.
6. Determination of Stiffness and Modulus of rigidity of open coil spring

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.

COURSE OUTCOMES:

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

CO1: describe stress, strain, elastic constants and their relationship.

CO2: determine the principal stresses and strains based on various methods.

CO3: develop the torsion equation and solve the problems based on torsion.

CO4: determine the stress in thin cylinders and spheres

CO5: determine the stress in thick cylinders and spheres

Board of Studies (BoS) :   **Academic Council:**

BOS of Physics was held on 21.6.21   17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	H	M	L	L	M	M	M	L	L	L	M	M	-	-	-
CO2	H	M	M	L	L	M	L	L	L	L	L	M	-	-	-
CO3	H	M	M	L	L	L	L	L	L	L	L	M	-	-	-
CO4	H	M	M	L	M	M	M	L	L	L	M	M	-	-	-
CO5	H	M	M	L	M	M	M	L	L	L	M	M	-	-	-

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

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

Statement: The modules and topics mentioned in this course are designed to ensure all inclusive and thorough education with equity to all persons and promote learning opportunities at all times.

CHD 1181	**ENGINEERING MATERIALS AND**	L	T	P	C
SDG: 9	**APPLICATIONS**	3	0	2	4

COURSE OBJECTIVES:

To make the students conversant with

COB1: preparation, properties and applications of various polymers and composites

COB2: synthesis, properties and applications of nanomaterials

COB3: the basic concepts and different types of catalysts involved in catalytic processes.

COB4: basic principles and its applications of certain spectroscopic techniques towards characterization of chemical compounds and concepts of photochemical processes involved in photochemical reactions.

COB5: different types of sensors and its applications.

MODULE I   POLYMER AND COMPOSITES   9

Introduction – classification: source, heat, composition and structure- glass transition temperature – synthesis, properties and applications of polycarbonate, polyurethane, teflon, ABS, kevlar, bakelite, epoxy resin, acrylic polymers (PAN) - biopolymers : importance and applications of biodegradable polymers (PLA, PHBV).

Composites- Introduction - properties and applications: fibre-reinforced plastics (glass, carbon and aramid), ceramic matrix composites (CMC) –- bio-composites.

MODULE II   NANOCHEMISTRY   9

Introduction – classification based on dimension with examples – properties of nanomaterials (surface to volume ratio and size quantisation effect) - synthesis of nanomaterials (Top-down and Bottom-up)– role of capping & reducing agents - CVD (CNT), laser ablation (Ag, Ag_2O), electrodeposition (semiconductor materials), precipitation (Ag, Au), thermolysis: solvothermal (CuO, CeO_2) and hydrothermal (TiO_2, ZnO, carbon dots), microwave method (metal oxide), bio-nanomaterials - biogenic method (synthesis of Ag, Au by plants extracts, bacteria, fungi)

MODULE III   CATALYSIS   9

Types of catalysis – Criteria for catalysts - catalysis by transition metal ions and their complexes-   solid catalyst - metal oxides and zeolites - shape

selective catalysts- mechanism of catalytic action- CO oxidation, NOx and SOx reduction – Enzyme catalysis-Mechanism of enzyme action- electrocatalysis - green catalyst.

MODULE IV   PHOTOCHEMISTRY AND SPECTROSCOPY   9

Laws of photochemistry – Quantum yield -– Jablonski diagram - photophysical processes - photosensitisation – Quenching– chemiluminescence – bioluminescence
Atomic and molecular spectrum – absorption and emission spectrum - Beer Lambert's law – problems and applications – principles and applications: colorimetry, UV -vis spectroscopy (Chromophore- auxochrome, red and blue shift), atomic absorption spectroscopy, IR spectroscopy (finger print region, functional group interpretation)

MODULE V   SENSORS   9

Sensors – types: bio and toxic chemicals sensors- principle, working and applications of Electrochemical sensors: MEMS and NEMS, - Biosensors-construction, working and classification, Advantages - Biochips - touch sensor (oxi and gluco meter) - Advanced sensors:Smoke and gas sensors, humidity sensors, temperature sensor and alcohol sensor.

PRACTICALS
List of Experiments
1. Preparation of polymers – phenol-HCHO, urea-HCHO, polylactic acid, epoxy resin
2. Determination of molecular weight and degree of polymerization using Oswald'sviscometer.
3. Synthesis of nano-ZnO and CuO by precipitation
4. Demonstration of Laser ablation techniques for nanomaterials.
5. Electrochemical synthesis of graphene oxide
6. One-pot synthesis using green catalyst.
7. Green synthesis: Photocatalytic reactions, solvent - free organic reaction - Aldol; green oxidation, green reduction.
8. Diels - Alder reaction in eucalyptus oil (green process).
9. Spectrophotometer iron estimation.(Beer Lambert's law) determination of Fe^{3+}
10. FT-IR spectral characterisation (functional group interpretation)

L – 45; P – 30; Total Hours– 75

TEXT BOOKS:

1. Jain P.C and Renuka Jain, Physical Chemistry for Engineers, Dhanpat Rai and Sons, New Delhi. 2016.
2. G.A. Ozin and A.C. Arsenault, "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, Thomas Graham House, Cambridge,2012.
3. B. Viswanathan, S. Sivasanker and A.V. Ramaswamy (Editors), Catalysis: Principles and Applications, Narosa Publishing House, 2002.
4. Gadi Rothenberg, Catalysis: Concepts and Green Applications, WILEY-VCH
5. Nicholas J. Turro, V.Ramamurthy and Juan C. Scaiano, Principles of molecular photochemistry: An introduction, University Science Books, Sausalito, CA, 2009.
6. John Vetelino, Aravind Reghu , Introduction to Sensors By · 2017.

REFERENCES:

1. John S. Wilson, Sensor Technology Handbook, Elsevier 2005.

COURSE OUTCOMES:

The students will be able to

CO1: enumerate and compare the preparation, properties and applications of various types of polymers and composites.

CO2: synthesize different type of nanomaterials on a commercial scale based on its size and applications.

CO3: apply the concepts of spectroscopic techniques towards spectral interpretation for identification of compounds and explain various photochemical processes in photochemical reactions.

CO4: Impart types, characteristics and applications of different types of catalyst.

CO5: categorize the sensors and its applications to real time situation.

Board of Studies (BoS) :
11thBoS of Chemistry held on 17.06.2021

Academic Council:
17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1				M											
CO2				M											
CO3							M								
CO4				M											
CO5				M											

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

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

The holistic understanding of materials and technology leads to sustainable industrialization

MAD 1181

SDG: 4

ALGEBRA AND DIFFERENTIAL CALCULUS	L	T	P	C
	3	1	0	4

COURSE OBJECTIVES:

COB1: To introduce matrix algebra techniques for engineers to apply in practical problems

COB2: To find the roots of polynomial equations using different techniques

COB3: To demonstrate the concepts of limits, continuity and application of differential calculus.

COB4: To familiarize the students with the functions of several variables

COB5: To develop the use of differential equations necessary for engineering applications

MODULE I   MATRICES   9+3

Characteristic Equation- Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton Theorem (without proof) – Orthogonal matrices – orthogonal transformations of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation

MODULE II   THEORY OF EQUATIONS   9+3

Introduction - Surds and irrational roots – simple problems – Equations whose roots are in A.P,G.P and in H.P – Relations between the roots and coefficients – symmetric functions – Formation of equations – Decreasing and Increasing the roots – transformation of equation – Reciprocal equations

MODULE III   DIFFERENTIAL CALCULUS   9+3

Limits of functions - one sided limits – Continuity - Curvature – Cartesian and polar coordinates – center and radius of curvature – Circle of curvature – Involutes and evolutes – Envelopes

MODULE IV   DIFFERENTIAL CALCULUS OF SEVERAL   9+3
                           VARIABLES

Laws of limits –Functions of two variables – partial derivatives – total differential – Implicit Functions – Jacobian - Taylor's series expansion – Optima of two variables – Lagrange's multiplier method

MODULE V   ORDINARY DIFFERENTIAL EQUATIONS   9+3

Linear equations of second order with constant and variable coefficients –

Simultaneous first order linear equations with constant coefficients – homogeneous equations of Euler's type – method of undetermined coefficients- method of variation of parameters

L – 45; T – 15; Total Hours– 60

TEXT BOOKS:
1. Ramana, B.V, "Higher Engineering Mathematics" Tata McGraw Hill Publishing Co. New Delhi, 2010.
2. Grewal B.S., "Higher Engineering Mathematics" 44th edition, Khanna Publishers, New Delhi, 2017.
3. Kreyszig, E., "Advanced Engineering Mathematics", 10th edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2011

REFERENCES:
1. Veerarajan.T., "Engineering Mathematics" (5th edition) Tata Mc Graw Hill Publishing Co. New Delhi, 2012
2. Jain, R.K. & Iyengar, S. R. K., "Advanced Engineering Mathematics", Narosa Publishers, 5th edition, 2016.
3. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th edition, Cengage Learning, 2011.
4. Venkataraman, M.K., "Engineering Mathematics", Volume I, 2nd edition, National Publishing Co., Chennai, 2003.
5. James Stewart ," Calculus" 7th edition, Brooks/Cole Cengagelearning, UK

COURSE OUTCOMES:
At the end of the course students will be able to
CO1: use the matrix algebra methods for finding eigenvalues, eigenvectors and diagonalization
CO2: solve equations using the relations between roots and coefficients
CO3: apply differential calculus in various engineering problems
CO4: able to use differential calculus on several variable functions
CO5: solve various types of differential equations that arise in many applications

Board of Studies (BoS) :
12th BOS of Mathematics & AS held on 23.06.2021

Academic Council:
17th AC held on 15.07.2021

	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	PSO 3
CO1	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	M	-	--	--	--	-	-	-	-	-	-	-	-	-	-
CO5	M	L	-	-	-	--	--	--	--	--	--	--	--	--	--

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

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

Learning of various mathematical techniques like matrices and calculus will lead to knowledge of applications in Engineering problems

GED 1101   **ENGINEERING GRAPHICS**   **L   T   P   C**

                                              2   0   2   3

SDG: 9

COURSE OBJECTIVES:

COB1: To introduce the basic concepts of engineering drawing, and familiarize with conic sections, special curves and orthographic projection of points and straight lines

COB2: To get practical exposure on projection of planes and solids

COB3: To be familiar with sectioning of solids, and development of surfaces

COB4: To conversant with 3D isometric projection, and perspective projection of simple solids

COB5: To introduce computerized drafting using CADD for drawing the orthographic views of simple solids

MODULE I	**BASICS, ENGINEERING CURVES AND ORTHOGRAPHIC PROJECTION OF POINTS AND STRAIGHT LINES**	**L: 7** **P: 7**

Drawing instruments, dimensioning, BIS conventions, types of lines, simple geometric constructions.

Conic sections: ellipse, parabola, hyperbola. Special curves: cycloid, epicycloid, hypocycloid and involutes.

Orthographic projection – first angle, second angle, third angle and fourth angle projections. Orthographic projection of points in all quadrants. Projection of straight lines in first quadrant – true length and true inclinations –traces of straight line.

MODULE II	**PROJECTION OF PLANES AND SOLIDS**	**L: 7** **P: 7**

Projection of plane lamina in first quadrant and its traces

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

MODULE III	**SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES**	**L:5** **P:5**

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

Development of surface of truncated solids: prism, pyramid, cone and

cylinder – frustum of cone, pyramid and simple sheet metal parts.

MODULE IV   THREE DIMENSIONAL PROJECTIONS   L:4
P: 4

Isometric projection: Isometric scale – isometric axes- Isometric projection and view of prism, pyramid, cylinder, cone and frustums.

Perspective projection: station point – vanishing point – Perspective projection and views of prism, pyramid by Visual ray method.

MODULE V   ORTHOGRAPHIC PROJECTION USING CADD   L:7
P:7

Introduction to CADD - Basic commands for sketching - Editing sketches - creating texts and tables - Basic dimensioning and editing dimensions - Sketching orthographic views of simple solids and machine parts as per first angle projection - Plotting drawings.

L – 30; P – 30; Total Hours– 60

TEXT BOOKS:

1. N.D. Bhatt, "Engineering Drawing", Charotar Publishing house, 53rdEdtion, 2014.
2. Venugopal. K, and V. Prabhu Raja, "Engineering Graphics", New Age International (P) Ltd., Publication, Chennai, Edition 15, 2017.

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, 2012.
3. Jeyapoovan, T., "Engineering Graphics using AutoCAD", Vikas Publishing House Pvt. Ltd., New Delhi, 2015.
4. AutoCAD Software Theory and User Manuals
5. Engineering graphics You tube Lecture videos link: https://www.youtube.com/user/BSAUNIV/videos

COURSE OUTCOMES:

After completion of the course, students should be able to

CO1: identify the specifications and standards of technical drawing and draw conic sections, special curves and orthographic projection of points and straight lines

CO2: apply the concept of orthographic projection to draw the orthographic views of plane figures and simple solids

CO3: draw the sections of solids and development of solid surfaces

CO4: apply the concept of isometric and perspective projection to draw the 3-D views of simple solids

CO5: draw the orthographic views of simple objects using drafting software

Board of Studies (BoS):   **Academic Council:**

18thBoS of MECH held on 21.06.2021   17th AC held on 15.07.2021

	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	M	L	L	-	-	-	-	-	-	L	-	-	-	-
CO2	M	L	L	-	-	-	-	-	-	L	-	-	-	-
CO3	M	L	L	-	-	-	-	-	-	L	-	-	-	-
CO4	M	L	L	-	-	-	-	-	-	L	-	-	-	-
CO5	M	L	L	-	M	-	-	-	-	L	-	-	-	-

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

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

The various industrial standards of technical drawing and the application of orthographic projections to draw simple solids helps to innovate a new design for sustainable industrialization

GED 1102	**ENGINEERING DESIGN**	L	T	P	C
SDG:9		2	0	0	2

COURSE OBJECTIVES:

COB1: To learn the basic concepts of design in engineering

COB2: To study the basic design thinking principles in problem solving

COB3: To encourage the students to develop a prototype using design concepts

COB4: To introduce the role of innovation in engineering

MODULE I   INTRODUCTION TO DESIGN   08

Introduction to Engineering design – Design thinking – Problem identification - Design of Product, Process, System and Software – Case studies on Product, Process, Systems and Software design.

MODULE II   DESIGN THINKING PROCESS   08

Empathy – Ideate - Need analysis - Voice of customers - product specification - concept generation - Bench marking - Quality function deployment - Concept evaluation - Case studies

MODULE III   PROTOTYPE DESIGN   07

Product form and function – High level design – Design detailing - Sketch models – Prototypes - 3D printing - Case studies.

MODULE IV   INNOVATION   07

Creativity and innovation – Role of innovation in Engineering – incremental changes and systemic changes; scientific approach to driving innovation – Intellectual property rights - case studies on innovative products.

L – 30; Total Hours– 30

TEXT BOOKS:

1. Clive L. Dym, Patrick Little, and Elizabeth J. Orwin, "Engineering Design: A Project Based Introduction", 4th Edition, Wiley, 2014.
2. Eppinger, S. and Ulrich, K., "Product design and development", McGraw-Hill Higher Education, 2015.

REFERENCES:

1. Nigel Cross, "Design Thinking", Berg Publishers, 2011.
2. Tom Kelley, "The Art of Innovation", Profile Books Ltd, London, 2016.
3. Tim Brown, "Change by Design", HarperCollins e-books, 2009.
4. Cliff Matthews, "Case Studies in Engineering Design", John Wiley & Sons Pvt. Ltd, New York, 1998.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO1: explain the basic concepts of design in engineering products / process / service

CO2: analyse the problems and perform design thinking process

CO3: correlate the basic principles of design thinking to solve engineering problems and develop prototypes

CO4: apply innovative approaches to engineering problems and provide design solutions

Board of Studies (BoS):

18thBoS of MECH held on 21.06.2021

Academic Council:

17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2
CO1	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	H	-	-	-	-	-	-	-	-	-	-	-	-
CO3	H	-	H	-	M	-	-	-	-	L	-	L	-	-
CO4	-	-	M	-	-	-	-	-	-	L	-	L	-	-

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

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

The holistic understanding of basic knowledge in Engineering design and its process in the development of prototypes results in satisfying industrial challenges.

GED 1103

SDG: 9

MANUFACTURING PRACTICES LABORATORY

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

COB1: To learn the basics of pipe connections used in household and industrial systems

COB2: To educate the usage of welding equipment's and machining methods

COB3: To impart knowledge onsand mould preparation for simple components

COB4: To explorevarious tools, instruments and methods used in electrical wiring

COB5: To impart knowledge onDesign, assembly and testing of electronic circuits

PRACTICALS

List of Experiments:

CIVIL ENGINEERING PRACTICE:

1. Study of plumbing in general household and industrial systems: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
2. Making a small window frame with Lap and Mortise & Tenon Joints by sawing planing and cutting.
3. Introduction to power tools

MECHANICAL ENGINEERING PRACTICE:

1. Fabrication of a small Table frame with Butt, Lap and Fillet Joints using Arc Welding - Gas cutting (Demo)
2. Machining of a component using simple turning and drilling practices.
3. Foundry operations such as sand mold preparation for simple component.
4. Plastic Component Manufacturing (Demo on Injection / Blow moulding)

ELECTRICAL ENGINEERING PRACTICE:

1. Comparison of incandescent, fluorescent, CFL and LED lamps.
2. Domestic, staircase and go down wiring.
3. Measurement of earth resistance.
4. Study of protection devices (small relay, fuse, MCB, HRC, MCCB,

ECCB).

5. Familiarization of household electrical gadgets (Iron Box, Wet Grinder).
6. Study of inverter fed UPS/Emergency lamp

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

P – 30; Total Hours– 30

TEXT BOOK:

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: demonstrate Plumbing requirements of domestic buildings.

CO2: use welding equipment's to join the structures and to carry out machining operations

CO3: perform the task of making sand mould for simple components

CO4: execute simple electrical wiring and comprehend the construction and working of household appliances.

CO5: assemble and test simple electronic circuits used in day-to-day life

Board of Studies (BoS):   **Academic Council:**
18thBoS of MECH held on 21.06.2021   17th AC held on 15.07.2021

	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	M	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	M	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	L	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	L	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

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

The holistic understanding of welding, moulding, machining, wiring and electronic circuit increases the access of small-scale industrial and other enterprises in developing countries.

GED 1104	**PROGRAMMING FOR**	L	T	P	C
SDG: 8	**PROBLEM SOLVING**	**1**	**0**	**2**	**2**

COURSE OBJECTIVES:

> **COB1:** To explore the hardware and software components of the computer
>
> **COB2:** To learn the structured and procedural programming concepts using C.
>
> **COB3:** To study the constructs of decision making in branching and iteration statements
>
> **COB4:** To learn Functions for effective reusability and readability of the code.
>
> **COB5:** To understand pointer and file operation concepts.

MODULE I   INTRODUCTION TO C PROGRAMMING   05

Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, system software, compilers, creating, compiling and executing a program, Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming - Structure of C - C Tokens – Data Types – Declaration of Variables and Storage class – Operators – Expressions - Type Conversion.

MODULE II   DECISION MAKING AND ARRAY   05

Decision Making and Branching: Simple if Statements, The if..else statements, Nesting of if..else statements, else…if Ladder, switch Statements, goto Statements, Looping: while, do…while, for Statements, Array: One-Dimensional, Two-Dimensional and Multi-Dimensional operations.

MODULE III   USER-DEFINED FUNCTIONS AND FILE   05
**   OPERATIONS**

Definition of Functions - Function Types – Nesting of Functions – Recursion – Structures and Unions – Pointers - File handing operations.

PRACTICALS
LIST OF PROGRAMS IN C:
   1. Computer organization –Hardware in a typical computer

Identification – Booting error messages and what it means
2. Structure of a basic program - Hello world program
3. Data types and Type conversions
4. Input / Output: Formatted functions – Unformatted functions – Library functions
5. Properties of operators – Priority of operators – Arithmetic relational logical and bitwise operators
6. Conditional Statements: If – if else- nested if else- goto- switch case – nested switch case
7. Iteration Statements: for loops – nested for loops – while loop – do-while loop – break and continue statement
8. I/O operations of one- and two-dimensional arrays
9. Bubble Sort and Linear Search using arrays.
10. Functions and its types, Recursion Function
11. Pointers
12. File Operations

L – 15; P – 30; Total Hours– 45

TEXT BOOKS:

1. Richard L. Stegman, "Focus on Fundamentals of Programming with C", Ninth Edition, ISBN -170077395X, 9781700773951, 2019.
2. E.Balagurusamy, "Programming in ANSI C", McGraw Hill Education, Eighth Edition, ISBN-13: 978-93-5316-513-0, ISBN-10: 93-5316-513-X, 2019.

REFERENCES:

1. Brian W. Kernighan and Dennis M. Ritchie, " The C Programming Language", Prentice Hall, ISBN 0-13-110362-8, 2015.
2. Ashok N Kamthane, "Computer Programming", Pearson Education, 2nd
   Edition, ISBN 13: 9788131704370, 2012.
3. Paul J. Deitel, Deitel & Associates, "C How to Program", Pearson Education, 7th Edition, ISBN-13: 978-0132990448, 2012.

COURSE OUTCOMES:

Students who complete this course will be able to

CO1: identify the hardware components and describe the software components of computer.

CO2: bring out the importance of structural and procedural programming

CO3: write C coding using conditional and iteration statements

CO4: develop programs using Functions, Pointers and Files

CO5: implement program to build a real time application.

Board of Studies (BoS) :   **Academic Council:**

18th BoS of CSE held on 26.07.2021   17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	M	L	H	-	L	-	-	M	-	-	-	-	-
CO2	H	M	M	-	-	H	M	-	M	-	-	-	-	-
CO3	H	M	H	-	-	H	-	-	H	-	-	-	-	-
CO4	H	H	H	H	M	H	-	-	H	-	-	-	-	-
CO5	H	H	H	H	H	H	H	H	H	L	H	H	-	-

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

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

Statement: The students can have productive employment and decent work by learning this computer fundamentals and programming course.

SEMESTER II

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

COURSE OBJECTIVES:

COB1: To train students to use appropriate vocabulary in academic and technical contexts

COB2: To facilitate students to speak effectively while exchanging ideas and making presentations

COB3: To develop students' listening skill for comprehending and analysing information

COB4: To develop their reading skill through sub skills like skimming, scanning and critical reading of a text

COB5: To sharpen their academic writing skills

COB6: To expose them to the correct usage of language and help them to apply that knowledge appropriately

MODULE I   HUMAN RESOURCES   10

L: Listening to short texts – short formal & informal conversations.

S: Introducing one self – exchanging personal info.

R: Process of reading purposes, Reading comprehension, improving comprehension skills, Reading activities – short comprehension passages, practice in skimming & scanning.

W: Scientific & Technical Writing, Editing skills, Activities – completing sentences, developing hints - Paragraph Writing

Voc. development: Prefixes, Suffixes

Lang. development: Articles, Countable and Uncountable nouns, Present tense, Wh – Questions, Yes or No questions.

MODULE II   TRANSPORT   10

L: Listening to long scientific talks

S: Sharing personal information – greeting, leave taking.

R: Comprehension passages with multiple choice questions / Wh–questions/ openended questions - Reading longer technical texts & completing exercises based on them.

W: Use of reference words & discourse markers on a text, jumbled sentences, describing a process – flow chart, use of sequence words.

Voc. development: Guessing meanings of words in context, vocabulary used in

formal letters, e-mails & reports.

Lang. development: Preposition of Time, Place & Date, Past tense, Conjunctions, Impersonal passive voice, Question tags, Numerical Adjectives.

MODULE III   ENERGY   9

L: Listening to talk on the topic & completing tasks.

S: Asking about routine actions & expressing opinions.

R: Locating Specific Information

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

Voc. development: Sequence words, misspelt words.

Lang. development: Adverbs, Degrees of comparison, Future tense, Homophones

MODULE IV   OUR LIVING ENVIRONMENT   8

L: Listening to scientific texts & making notes – Effective ways of making notes.

S: Speaking about one's friend.

R: Reading texts & magazines for detailed comprehension. (Students can be asked to read any book of their choice to encourage reading habit)

W: Argumentative writing.

Voc. Development: Synonyms, antonyms, phrasal verbs.

Lang. development: If clauses, Subject - Verb Agreement

MODULE V   TECHNOLOGY   8

L: Listening to talks (General & Scientific).

S: Short group conversations.

R: Reading and understanding technical articles, Short narratives & articles from Newspaper including conversations.

W: Short essays, Dialogue writing.

Voc. Development: Idioms & Phrases.

Lang. development: Modal verbs.

L – 45; Total Hours– 45

TEXT BOOKS:

1. Board of Editors. Using English A Coursebook for Undergraduate Engineers and Technologists. Orient BlackSwan Limited, Hyderabad: 2015

2. Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.

REFERENCES:

1) Perry, Carol Rosenblum (2011). The Fine Art of Technical Writing, Create Space Independent Publishing Platform, New Delhi.
2) Dutt, P.K. Rajeevan G. and Prakash, C.L.N. (2007). A course in Communication Skills, Cambridge Univesity Press, India.
3) Sen, Leena (2004). Communication Skills, Prentice Hall, New Delhi.
4) Matt Firth, Chris Sowton et.al (2012). Academic English an Integrated Skills Course for EAP, Cambridge University Press, Cambridge.
5) Bailey,Stephen 2011. Academic Writing: A practical guide for students, New York, Rutledge.
6) Redston, Chris & Gillies (2005). Cunningham Face2Face (Pre-intermediate Student's Book&Workbook) Cambridge University Press, New Delhi.
7) Dutt P. Kiranmai and RajeevanGeeta (2013). Basic Communication Skills, Foundation Books.

COURSE OUTCOMES:

CO1: Read articles of a general kind in magazines and newspapers

CO2:Participate effectively in conversations, introduce themselves and their friends and express opinions in English

CO3: Comprehend conversations and short talks delivered in English

CO4: Write short essays of a general kind and letters and emails in English

CO5: Express through speaking and writing using appropriate vocabulary and grammar

Board of Studies (BoS) :
13thBoS of Department of English held on 17.6.2021

Academic Council:
17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										M		
CO2										H		
CO3										M		
CO4										H		
CO5										M		

Note: L - Low Correlation   M -Medium Correlation   H - High Correlation

SDG No. 4: Give Quality Education to all the Engineers

Statement: In future, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship.

MAD 1281　　　　　　**ADVANCED CALCULUS**　　　L　T　P　C

SDG: 4　　　　　　　　　　　　　　　　　　　　　3　1　0　4

COURSE OBJECTIVES:

COB1: To acquaint in the students in solving problems using multiple integrals

COB2: To acquire knowledge in vector calculus which is significantly used in engineering problems

COB3: To learn about the analytic functions and their mapping properties

COB4: To know complex integration using Cauchy's theorems.

COB5: To introduce techniques and engineering applications of Laplace Transforms

MODULE I　　　　　　MULTIPLE INTEGRATION　　　　　　9+3

Multiple integrals– Cartesian and Polar coordinates – Change of order of integration – Beta and Gamma functions – Properties and applications-Multiple integrals to compute area and volume

MODULE II　　　　　　VECTOR CALCULUS　　　　　　9+3

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields–Line, surface and volume integrals – Green's Theorem, Gauss Divergence Theorem and Stokes Theorem (statement only) – verification and evaluation of integrals

MODULE III　　　　　　COMPLEX DIFFERENTIATION　　　　　　9+3

Analytic function - Necessary and Sufficient condition for analyticity – Cauchy-Riemann equations in polar coordinates - properties of analytic function – determination of analytic function – conformal mapping (w = z+a, az and 1/z) and bilinear transformation

MODULE IV　　　　　　COMPLEX INTEGRATION　　　　　　9+3

Cauchy's integral theorem – Cauchy's integral formula – Taylor's series and Laurent's series expansion – singularities - classification – residues - Cauchy's residue theorem – contour integration – Unit circle and semi circular contours (excluding poles on the real axis)

MODULE V　　　　　　LAPLACE TRANSFORMS　　　　　　9+3

Introduction to Laplace transform - Existence of Laplace Transform - Properties of Laplace Transforms - Initial & Final Value Theorems - Inverse Laplace

Transform - Convolution Theorem – Circuits to signal square wave: Integral equations with unrepeated complex factors – Damped forced vibrations: repeated complex factors – Resonance - Solution of differential equations

L – 45; T - 15; Total Hours– 60

TEXT BOOKS:

1. Ramana, B.V, "Higher Engineering Mathematics" Tata McGraw Hill Publishing Co. New Delhi, 2010.
2. Grewal B.S., "Higher Engineering Mathematics" 44th edition, Khanna Publishers, New Delhi, 2017.
3. Kreyszig, E., "Advanced Engineering Mathematics", 10th edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2011

REFERENCES:

1. Jain, R.K. & Iyengar, S. R. K., "Advanced Engineering Mathematics", Narosa Publishers, 5th edition, 2016.
2. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th edition, Cengage Learning, 2011.
3. Venkataraman, M.K., "Engineering Mathematics", Volume I, 2nd edition, National Publishing Co., Chennai, 2003.
4. James Stewart ," Calculus" 7th edition, Brooks/Cole Cengagelearning, UK

COURSE OUTCOMES:

At the end of the course students will be able to

CO1: compute the area and volume using multiple integrals

CO2: calculate vector identities and apply Gauss, Stokes and Greens theorems to simplify calculations of integrals

CO3: verify analyticity, conformity and bilinearity of complex functions

CO4: evaluate integrals using the Cauchy's integral and formula and residue theorem

CO5: solve ordinary differential equations using Laplace transforms

Board of Studies (BoS) :	**Academic Council:**
12th BOS of Mathematics & AS held on 23.06.2021	17th AC held on 15.07.2021

	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	PSO 3
CO1	M														
CO2	M														
CO3	H														
CO4	M														
CO5	M														

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

Learning of various mathematical techniques like Integration and Vector Calculus will lead to knowledge of applications in Civil Engineering

GED 1202

SDG: 3, 5, 8, 12

**BASIC ELECTRICAL AND
ELECTRONICS ENGINEERING**

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

COB1: To make the students understand the basic calculations and measurements in DC circuits.

COB2: To provide the basic knowledge on AC circuit calculations and measurements.

COB3: To familiarize with working and characteristics of different DC and AC machines.

COB4: To impart knowledge onbasic semiconductor devices and their applications.

COB5: To introduce the students to fundamentals of digital electronics.

MODULE I   DC CIRCUITS & MEASUREMENTS   12

The concept of voltage and current-Electric circuit elements: R, L, C –Independent and dependent sources - Ohm's law- Kirchhoff's law- series and parallel resistive circuits – Voltage and current division – Star-delta transformation - Mesh and nodal analysis of resistive circuits – simple problems - Measurement ofvoltage, current and power in DC circuits.

MODULE II   AC CIRCUITS & MEASUREMENTS   17

Sinusoidal voltage - RMS, average, peak value, peak factor and form factor - single phase RL, RC and RLC circuits –phasor representation - complex power – power factor - simple problems - Resonance in RLC circuits – 3 phase balanced circuit calculations– star and delta connections - Principles of measurement of AC voltage, current, power and energy - Measurement of three phase power.

MODULE III   ELECTRICAL MACHINES   18

Construction, principle of operation, basic equations, characteristics and applications of DC generators, DC motors, single phase transformers and three phase induction motors. Working principle of BLDC Motor and its applications in home appliances. (Qualitative treatment only).

MODULE IV   SEMICONDUCTOR DEVICES AND APPLICATIONS   14

Introduction to semiconductors - Characteristics of PN Junction Diode – Zener Diode and its characteristics – SCR and its characteristics –– Bipolar Junction Transistorand its characteristics – JFET & MOSFET – their characteristics.
Applications: Half wave and full wave rectifiers - Voltage Regulation – Regulator ICs.

MODULE V   INTRODUCTION TO DIGITAL CIRCUITS   14

Logic gates- Boolean algebra theorems– K Map-Introduction to combinational circuits– Flip-Flops – Registers– A/D and D/AConversion–Data acquisition systems

PRACTICALS

List of Experiments

1. Verification of KCL and KVL (ii) Measurement of voltage, current and power in DC circuits.
2. (i) Resonance of RLC series circuit

   (ii) Measurement of voltage, current, power and power factor in single phase & three phase AC circuits.
3. (i) Magnetization characteristics of DC generator

   (ii) Characteristics of DC shunt motor, single phase transformer and three phase induction motor.
4. Fabrication of a low voltage regulated power supply.
5. Implementation of half and full adders.

L – 45; P – 30; Total Hours– 75

REFERENCES:

1. Edward Hughes, "Electrical and Electronics Technology", Pearson India, 12th Edition, 2016.
2. D P Kothari and I J Nagrath, "Basic Electrical Engineering", McGraw Hill Education, First Edition, 2017.
3. Cotton H, "Electrical Technology", CBS Publishers, 7th Edition, 2007.
4. Del Toro, "Electrical Engineering Fundamentals", Pearson Education, New Delhi, 2015.
5. Jacob Millman & Christos C. Halkias, Satyaprataba Jit "Electronic Devices and Circuits" McGraw Hill Education, 4th Edition, 2021.
6. Floyd, "Electronic Devices: Conventional Current Version" Pearson Education India, 7th Edition, 2008.
7. S. Salivahanan, N. Sureshkumar and A. Vallavaraj, "Electronic Devices and Circuits", McGraw Hill Education (India) Pvt. Ltd., 2018.
8. Thomas L. Floyd, "Digital Fundamentals", 10th Edition Pearson Education Inc., New Delhi, 2008.

COURSE OUTCOMES:

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

CO1: perform the basic calculations in DC circuits and measure the various quantities associated with DC circuits.

CO2: measure and compute the rms current and voltage, power, power factor and energy in AC circuits.

CO3: choose appropriate motor for specific applications based on the motor characteristics.

CO4: fabricate a regulated power supply for low voltage applications and build static switches using BJT and SCR.

CO5: build simple digital circuits like half adder and full adder.

Board of Studies (BoS) :
15th meeting of BoS of EEE held on 25.06.2021

Academic Council:
17th AC held on 14.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	H		H	L	M		M		L	L	M	L	-	-	-
CO2	H		H	L	M		M		L	L	M	L	-	-	-
CO3	H		H	L			M		L	L	M	L	-	-	-
CO4	H		H	L			M		L	L	M	L	-	-	-
CO5	H		H	L			M		L	L	M	L	-	-	-

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

SDG 3: Good health and well being.
Statement: Understanding of the fundamentals of electrical and electronics systems can help in designing systems to promote good health and well being.

SDG 5: Gender equality
Statement: Acquiring the interdisciplinary knowledge help overcome the gender barriers in work place.

SDG 8: Descent work and economic
Statement: The learners of this course can get descent work and earn financial benefits and they can work in interdisciplinary areas.

SDG 12: Responsible consumption and production.
Statement: Use of right and energy efficient electric and electronic components and devices results is reasonable consumption and production.

GED 1201   **ENGINEERING MECHANICS**   **L   T   P   C**

SDG: 9   **3   1   0   4**

COURSE OBJECTIVES:

COB1: To impart knowledge about the basic laws of mechanics, resolution of forces, equilibrium of particles in 2D and 3D force systems.

COB2: To learn about 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 study the laws of motion, impulse, momentum and elastic bodies

MODULE I   **VECTOR APPROACH AND EQUILIBRIUM OF**   **L: 11**
                      PARTICLE   **T: 3**

Introduction - Vectors – Vectorial representation of forces and moments – Vector Algebra and its Physical relevance in Mechanics – Laws of Mechanics – Parallelogram and triangular Law of forces- Coplanar Forces Principle of transmissibility, Resolution and Composition of forces- Forces in plane and space - Lame's theorem - Equilibrium of a particle in 2D plane - Equilibrium of a particle in 3D space - Equivalent systems of forces – Single equivalent force

MODULE II   **EQUILIBRIUM OF RIGID BODY**   **L: 7**
                                                       T: 3

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

MODULE III   **PROPERTIES OF SURFACES**   **L:10**
                                                       T:3

Determination of Areas – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, Angle section, Hollow section using standard formula – second and product moments of plane area – Physical relevance - Standard sections: Rectangle, triangle, circle- composite sections, Hollow section using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia

MODULE IV   FRICTION   **L:9**
                                                                   T:3

Introduction to friction- types of friction- Laws of Coloumb friction- Frictional force – simple contact friction –Block friction– Rolling resistance –ladder friction and wedge friction

MODULE V   LAWS OF MOTION   **L:8**
                                                                   T:3

Review of laws of motion – Newton's second law – D'Alembert's principle and its applications in plane motion; Work Energy Equation of particles– Impulse and Momentum – Impact of elastic bodies.

L – 45; T – 15; Total Hours– 60

TEXT BOOKS:
1. Beer, F.P and Johnston Jr. E.R, "Vector Mechanics for Engineers", McGraw Hill Education, 10th Edition, 2017.
2. R.K. Bansal., "A Text Book of Engineering Mechanics", 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, 2018.

COURSE OUTCOMES:
After completion of the course, students should be able to
CO1: resolve composite forces, apply concept of equilibrium to particles and solve problems
CO2: apply the concept of equilibrium to rigid bodies and solve problems
CO3: determine the properties of surfaces
CO4: analyse and evaluate the frictional forces between the bodies
CO5: apply the laws of motion in solving dynamics problems

Board of Studies (BoS):   **Academic Council:**
18th BOS held on 21.06.2021   17th AC held on 15.07.2021

	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	L	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	M	-	-	-
CO3	-	-	L	-	-	-	-	-	-	-	-	-	-	-
CO4	-	M	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	L	-	-	-	-	-

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

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

The understanding of force systems and its components leads to construction of robust engineeringsystems.

CED 1201

SDG: 9

BUILDING CONSTRUCTION AND PRACTICES

L	T	P	C
2	0	2	3

COURSE OBJECTIVES:

The main objective of this course is to impart knowledge on

COB1: various construction materials such as stone, brick, cement, steel etc with respect to type, mechanical properties and applications in industry.

COB2: allied construction materials used in construction and their properties & application areas.

COB3: requirements of vaiours components of buildings and types of structures

COB4: various basic construction practices suchs as mixing, joints in masonry and plastering and pointing

MODULE I   BASIC CONSTRUCTION MATERIALS   7

Physical and mechanical properties of construction materials – Bricks, Stones and cement : Manufacturing process, properties and testing methods. Sand, coarse aggregate and steel – Properties and testing methods.

MODULE II   ALLIED CONSTRUCTION MATERIALS   8

Tiles, refractory lining materials, Bitumen and asphaltic materials, Timber, Glass and Plastics, 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   OVERVIEW OF BUILDING PROCESS AND   7
                   COMPONENTS**

Overview of building process - elements of a building - basic requirements of a building - planning for orientation and energy efficiency.

Types of structures: Load Bearing, framed, steel and composite structures. Foundation: Safe bearing capacity of soil, Functions and requirements of good foundation, types of 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 PRACTICE   8

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- types - Painting - Purpose, types, ingredients and defects

PRACTICALS

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 Glass Material
5. Test on Tile
6. Test on Bricks – Water absorption, Efflorescence, Compressive Strength
7. Demonstrate the bonds used in brick Masonary
8. Plastering Process – Demo – Site Visit
9. Making model for Building Components
10. Painting – Exercise - Demo – Site Visit

L – 30; P – 30; Total Hours– 60

TEXT BOOKS:

1. Varghese.P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2012.
2. Rajput. R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.
3. Shetty.M.S., "Concrete Technology (Theory and Practice)", S. Chand and Company Ltd.,2008.
4. Gambhir.M.L., "Concrete Technology", 3rd Edition, Tata McGraw Hill Education, 2004
5. Duggal.S.K., "Building Materials", 4th Edition, New Age International , 2008

REFERENCES:

1. Jagadish.K.S, "Alternative Building Materials Technology", New Age International, 2007.
2. Gambhir. M.L., & Neha Jamwal., "Building Materials, products, properties and systems", Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2012.

3. S.S. Bhavikatti., "Basic Civil Engineering', New Age International (P) Limited, New Delhi, 2010

COURSE OUTCOMES:

On completion of the course the student will be able to

CO1: select the type of cement, and stones to be used based on the properties and application.

CO2: explain the properties and types of timber, bitumen, steel, aluminum, polymers and composites.

CO3: identify the different components in a building and its functions

CO4: apply the construction practices to be followed in the site

Board of Studies (BoS) :
15th BoS of CIVIL held on 23.06.2021

Academic Council:
17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	M	-	M	-	H	L	M	-	-	-	L	H	H	-	-
CO2	M	-	M	-	H	L	M	-	-	-	L	H	H	-	-
CO3	M	-	M	-	H	L	M	-	-	-	L	H	H	-	-
CO4	M	-	M	-	H	L	M	-	-	-	L	H	H	-	-
CO5	M	-	M	-	H	L	M	-	-	-	L	H	H	-	-

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

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

The Holistic understanding of building materials and components leads to construction of resilient infrastructure and sustainable development

CED 1202   **SURVEYING**   L   T   P   C

                                                                        3   0   2   4

SDG: 11

COURSE OBJECTIVES:

The objectives of the course are to impart knowledge on

COB1: basic concepts of surveying and to differentiate map and plan

COB2: the concept of linear measurement and angular measurement using compass and theodolite.

COB3: the concept of leveling using dumpy level and properties of contours.

COB4: the methods of plane tabling and solving triangulation and trilateration problems.

COB5: the usage of total station for the measurement of angles and distances and the concepts of engineering surveys and set out works.

MODULE I   INTRODUCTION TO SURVEYING   7

Basic definitions, objectives, divisions and Importance of surveying to Engineers; Plane and geodetic surveys; principles of Surveying; Output of survey, Maps, Plans, Scales.

MODULE II   LINEAR AND ANGULAR MEASUREMENTS   10

Direct and indirect methods of linear measurement; Obstacles in chaining and ranging, errors and corrections, Angular Measurements – Types of compass, basic definitions - meridians, local attraction, Theodolite - different types and their salient parts, Temporary and permanent adjustments, Methods of repetition and reiteration.

MODULE III   LEVELING AND CONTOURING   10

Basic Definitions, Curvature & Refraction, Level, Types and salient parts, working principle, Temporary and Permanent Adjustments, Leveling Staff, Methods of leveling - Differential leveling and field book note, Reciprocal Leveling; Profile leveling; Trigonometric leveling, Errors & Mistakes in leveling, Contouring - definition, characteristics, methods and applications.

MODULE IV   TRAVERSING,   TRIANGULATION   AND   10
                      TRILATERATION

Plane Tabling - Merits and demerits, accessories; methods of plane tabling; Traversing – open traverse, closed traverse, closing error, Triangulation and Trilateration – Purpose and classification of each; Horizontal and vertical

control methods, Triangulation network, fieldwork, selection of stations, measurements and computations. Heights and distances - Tacheometry- Introduction, Basic definitions, Methods, fundamental principles; Stadia system and Tangential system, methods.

MODULE V   TOTAL STATION AND ENGINEERING SURVEYS   8

Total Station - Working Principle, sources of errors in total station and types of total station instruments, advantages of total station, Engineering Surveys - General requirements and specifications for engineering project surveys; Reconnaissance, preliminary, location survey and surveys for highway, railway - Setting out works for buildings and simple circular curves – Applications of LIDAR.

PRACTICALS

List of Experiments:
1. Demonstration of various surveying instruments
2. Leveling - Longitudinal sectioning and Cross sectioning
3. Theodolite surveying - Measurement of horizontal angle and vertical angle by direct method.
4. Theodolite surveying - Measurement of horizontal angle by repetition and reiteration method.
5. Tacheometric surveying – Stadia method and Tangential method
6. Total station surveying - Measurement of distances - Single plane Method
7. Total station surveying - Measurement of distances - Double plane Method
8. Total station surveying - Determination of area of the field by triangulation method.
9. Setting out works - Foundation Marking
10. Setting out curves – Simple circular curve.
11. Determination of location of a point using GPS.

L – 45; P – 30; Total Hours– 75

TEXT BOOKS:
1. Arora. K.R., "Surveying", Vol. I & II, 15th Edition, Standard Book House, New Delhi, 2018.
2. Kanetkar. T.P., "Surveying and Levelling", Vol. I and II, Standard Publication, 2008.
3. Punmia. B.C., Ashok Kumar Jain and Arun Kumar Jain, "Surveying", Vol. I, II and III, 15th Edition, Laxmi Publications, New Delhi, 2015.

REFERENCES:

1. Clark. D., "Plane and Geodetic Surveying", Vol. I and II, 6th edition, C.B.S. Publishers and Distributors, New Delhi, 2017.
2. HeribertKahmen and Wolfgang Faig, "Surveying", Walter de Gruyter, 2012.
3. James M. Anderson and Edward M. Mikhail, "Introduction to Surveying", 7th Edition, McGraw Hill, 2015.
4. https://civilengineeringnotes.com/surveying/

COURSE OUTCOMES:

After completion of the course, the students will be able to

CO1: differentiate between map and plan, to know the different principles of surveying.

CO2: categorize the linear and angular measurements with the help of compass and theodolite.

CO3: determine the elevation of points and generate the surfaces of a given terrain.

CO4: apply the triangulation, traversing concepts in tacheometric surveying to compute heights and distances.

CO5: explore the total station surveying and set out curves to prepare preliminary and location survey for engineering projects.

Board of Studies (BoS) :
15thBoS of CIVIL held on 23.06.2021

Academic Council:
17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	H	H	L	L	H	L	L	-	L	L	-	-	L	M	-
CO2	H	H	M	M	H	L	L	-	L	L	-	-	L	M	-
CO3	H	H	M	M	H	L	L	-	L	L	-	-	L	M	-
CO4	H	H	M	M	H	L	L	-	L	L	-	-	L	M	-
CO5	H	H	M	M	H	L	L	-	L	L	-	-	L	M	-

Note: L- Low Correlation   M - Medium Correlation   H - High Correlation

SDG 11: Make cities inclusive, safe, resilient and sustainable.

Statement :

The gained knowledge leads to create, manage and geo-enable all the city assets and to digitally map the city to plan for safety, security, equality and inclusiveness.

CED 1203 **CIVIL ENGINEERING DRAWING** L T P C

SDG: 9 0 0 2 1

COURSE OBJECTIVES:

The objectives of this course are to impart knowledge on

COB1: the fundamentals of building drawing.

COB2: the basic principles of building drawing

COB3: the different views of a residential building

COB4: various structural drawing related to RCC and steel structure.

PRACTICALS

List of Experiments:

1. To learn the various building component – substructure, super structure – site plan, plinth area
2. To learn the various conventional sign and symbols
3. To learn the various commands in Auto CAD drawing
4. To draw the plan of a residential building
5. To draw the elevation of a residential building
6. To draw the section of a residential building
7. To draw the beam column position
8. To draw the various types of foundation
9. To draw the various types of a inclined roof trusses
10. To draw the service plan for plumbing lines
11. To draw the service plan for electrical lines
12. To draw the 3D view of a building

P – 30; Total Hours– 30

TEXT BOOKS:

1. Venugopal, K., "Engineering Drawing And Graphics", 5th Edition, New Age International (P) Ltd., New Delhi, 2011.
2. Gurcharan Singh, "Civil Engineering Drawing", Standard Publishers and Distributors, 2009.
3. Kumara Swamy, N. and Kameswara Rao, A., "Building Planning and Drawing", 6th Edition, Charotar Publishing House (P) Ltd, Gujarat, India, 2012.

REFERENCES:

1. IS 962: 1989 (R 2001), Code of Practice For Architectural and Building Drawings, Bureau of Indian Standards, New Delhi.

2. Gurcharan S i n g h , " Building Planning and Scheduling", Standard Publishers and Distributors, 2012.
3. Shah, M.G., Kale, C.M., Patki, S.Y., "Building Drawing: With an Integrated Approach to Built Environment", Tata McGraw-Hill Publishing Company (P) Ltd., New Delhi, 2002.

COURSE OUTCOMES:

After completion of the course students will be able to

CO1: identify the sign and symbols as per B.I.S. and develop a simple House plan and their sectional views.

CO2: prepare a plan, elevation and sectional view for a residential building.

CO3: develop structural drawings of RCC Buildings using CADD software.

CO4: locate and plan various service lines for a residential building as per codal recommendations.

Board of Studies (BoS) :

15th BoS of CIVIL held on 23.06.2021

Academic Council:

17th AC held on 15.07.2021

	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	PSO 3
CO1	L	-	L	L	-	-	-	L	-	-	-	L	L	M	-
CO2	L	-	L	L	-	-	-	L	-	-	-	L	L	M	M
CO3	L	-	L	L	-	-	-	L	-	-	-	L	L	M	-
CO4	L	-	L	L	-	-	-	L	-	-	-	L	L	M	M
CO5	L	-	L	L	-	-	-	L	-	-	-	L	L	M	-

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

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

Statement :

The holistic understanding of building Drawings leads to construction of resilient infrastructure and sustainable industrialization

GED 1206   ENVIRONMENTAL SCIENCES   L   T   P   C

SDG: All   (for Undergraduate B.Tech. Courses)   2   0   0   2

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   8

Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems - (a) Land resources: Land degradation soil erosion and desertification - (b) Forest resources: Use and over-exploitation, deforestation (c) Water resources: Use and over-utilisation of surface and ground water, conflicts over water, dams: benefits and problems, effects on forest and tribal people - (d) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, mining (e) Food resources: World food problems, 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.

MODULE II   ECOSYSTEMS AND BIODIVERSITY   8

Concept of an ecosystem - Food chains, food webs, Energy flow in the ecosystem - ecological pyramids - Ecological succession - Characteristic features, structure and function of (a) Terrestrial Ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem (b) Aquatic fresh water ecosystems: Ponds and lakes, rivers and streams (c) Aquatic salt water ecosystems: oceans and estuaries

Biodiversity and its conservation - Types: genetic, species and ecosystem diversity - Values of biodiversity - India as a mega-diversity nation - Invasive, endangered, endemic and extinct species - Hot sports of biodiversity and Red Data book - Threats to biodiversity - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

MODULE III ENVIRONMENTAL POLLUTION AND DISASTER MANAGEMENT 8

Sources, cause, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear pollution (h) 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.

MODULE IV HUMAN POPULATION, HEALTH AND SOCIAL ISSUES 6

Human Population - Population growth, Population explosion, population pyramid among nations - Family Welfare Programme - Human Rights - Value Education - Environment and human health: air-borne, water borne, infectious diseases, contagious diseases and immunisation (all types of vaccines from birth), risks due to chemicals in food and water, endocrine disrupting chemicals, cancer and environment - Sustainable development - Resettlement and rehabilitation of people - Environment Legislative laws- Women and Child Welfare, Public awareness.

Case studies related to current situation.

L – 30; 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 Jersy, 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.cgg.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) :

11th BoS of Chem held on 17.06.2021

Academic Council:

17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	-	L	M	-	-	L	M	-	-	-	-	-	-	-	-
CO2	-	-	-	M	H	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	M	M	-	-	L	-	-	-	-
CO4	-	-	-	-	-	M	M	M	-	-	-	L	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SDG All: No Poverty, Zero Hunger, Good Health and Well-Being, Quality Education, Gender Equality, Clean Water and Sanitation, Affordable & Clean Energy, Decent Work and Economic Growth, Industry, Innovation & Infrastructure, Reduced Inequalities, Sustainable Cities and Communities, Responsible Consumption and Production, Climate Action, Life Below Water, Life on Land, Peace, Justice and Strong Institutions, Partnerships for the Goals.

Statement: This course discuss about the environment, all the natural resources available, sharing of resources, effective utilisation, effects of over utilisation, health and environmental issues pertained to that, global warming and related issues, climates, disasters, impact assessments, population, human rights, societal welfare, laws to conserve the environment and sustainability.

SEMESTER III

MAD 2183	NUMERICAL METHODS FOR INTEGRATION	L	T	P	C
SDG: 4	AND DIFFERENTIAL EQUATIONS	2	0	0	2

COURSE OBJECTIVES:
This course aims to solve Integrations and Differential equations numerically.

MODULE I   NUMERICAL INTEGRATION   8
Numerical Integration by Trapezoidal and Simpson's 1/3 and 3/8 Rule – Romberg's Method – Two Point and Three point Gaussian Quadrature Formulae

MODULE II   NUMERICAL DOUBLE INTEGRATION   7
Double Integrals using Trapezoidal and Simpson's 1/3 Rules.

MODULE III   NUMERICAL SOLUTIONS OF FIRST ORDER ORDINARY   8
DIFFERENTIAL EQUATIONS
Single step methods: Euler method – Modified Euler method – Runge-Kutta method – Multi step methods: Milne's Predictor and Corrector Method – Adam's Predictor and Corrector Method.

MODULE IV   BOUNDARY VALUE PROBLEMS FOR PARTIAL   7
DIFFERENTIAL EQUATIONS
Finite Difference Solution of One Dimensional Heat Equation by Explicit and Implicit Methods – One Dimensional Wave Equation and Two Dimensional Laplace Equations.

TOTAL HOURS – 30

TEXT BOOKS:
1. M.K.Jain, S.R.K.Iyengar, R.K.Jain, "Numerical methods for Scientific and Engineering Computation", New Age International Publishers, New Delhi, 2003.
2. Grewal, B.S., "Numerical methods in Engineering and Science" 7 th edition, Khanna Publishers, 2007.
3. Dr. P. Mariappan "Numerical Methods for Scientific Solutions", New Century Book House(P) Ltd., 2022.

REFERENCES:
1. C.F.Gerald,   P.O.Wheatley,   "Applied   Numerical   Analysis"   Pearson

Education, New Delhi 2002.

2. P.Dechaumphai, N. Wansophark, "Numerical Methods in Engineering", Narosa Publications, 2012.

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

CO1: solve the single integration by numerical methods.

CO2: solve the double integration by numerical methods.

CO3: find numerical solution of first order ordinary differential equations in engineering problems.

CO4: find numerical solution of partial differential equations in engineering problems.

Board of Studies (BoS):

14th BOS of Mathematics & AS held on

30.06.2022.

	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	PSO 3
CO1	H	H	M								L				
CO2	H	H	M								L				
CO3	H	H	M								L				
CO4	H	H	M								L				

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

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

Learning of various numerical methods will lead to knowledge of applications in Civil Engineering.

CED 2101   **MECHANICS OF STRUCTURES**   L   T   P   C

SDG: 9 , 11   3   0   0   3

COURSE OBJECTIVES:

COB1: To provide in-depth knowledge with the computation of shear force, bending moment and draw the stress distribution under bending and shear.

COB2: To understand the concepts of slope and deflection of various determinate beams.

COB3: To understand the concepts of slope and deflection curves for various types of indeterminate beams.

COB4: To be familiar with the principles of energy methods and compute the structural deflections.

COB5: To enable the students to understand the fundamentals of axially loaded member and their behaviour under various loading conditions.

MODULE I   **TRANSVERSE LOADING ON BEAMS & STRESSES**   **9**
                 IN BEAMS

Types of beams – Types of loading acting on beams – Shear force and bending moment for cantilever beams, simply supported beams and overhanging beams – Theory of simple bending – Bending stress distribution - Shear stress distribution.

MODULE II   **SLOPE AND   DEFLECTION OF DETERMINATE**   **9**
                 BEAMS

Determinate and Indeterminate structure - Slope and deflection analysis of statically determinate beams - Macaulay's method – Moment area method – Conjugate Beam Method - Graphical method.

MODULE III   **SLOPE AND   DEFLECTION OF INDETERMINATE**   **9**
                 BEAMS

Statically indeterminate Structures - Propped cantilever, fixed and continuous beams - Theorem of three moments – Effect of the sinking of supports.

MODULE IV   **STRUCTURAL   DEFLECTIONS   –   ENERGY**   **9**
                 METHODS

Strain Energy - Strain Energy stored due to axial force, bending, shear and torsion - Virtual work method (Unit – load method) - Castigliano's Theorems – Maxwell's theorem of Reciprocal - Analysis of Plane Trusses and Plane Frames with the application of energy theorems for computing deflections.

MODULE V   COLUMNS AND STRUTS   9

Columns and Struts – Failure of a Column - Effective length of the column – Theory of Euler's Column – Crippling load on Columns with different end conditions – Euler's formula – Secant formula - Rankine's and Gordan's formula - I.S. Code formula – Beam- column subjected to distributed lateral load – Columns with initial curvature.

L – 45; Total Hours – 45

TEXT BOOKS:
1. Bedi, D.S., "Strength of Materials", Khanna Publishing House, New Delhi, 2013.
2. Bhavikatti S.S, Structural Analysis I", Vikas Publishing House Pvt. Ltd., 4th Edition, New Delhi, 2011.
3. Salah Khalfallah, "Structural Analysis 1: Statically Determinate Structures", John Wiley & Sons, New York, 2018.
4. Srivastava, A.K and Gope P.C., "Strength of Materials", PHI Learning Pvt. Ltd., New Delhi, 2013.

REFERENCES:
1. Gambhir, M.L., "Fundamentals of Structural Mechanics and Analysis", PHI Learning Pvt. Ltd., New Delhi, 2011.
2. Jindal, U.C., "Strength of Materials", Pearson Education, New Delhi, 2012.
3. Popov, E.P and Balan, T.A., "Engineering Mechanics of Solids", Pearson India Education Services, 2nd Edition, New Delhi, 2018.
4. Ramamrutham, S and Narayan, S., "Strength of Materials", Dhanpat Rai Publishing Company Pvt. Ltd., New Delhi, 2008.
5. Stephen Timoshenko, "Strength of Materials: Elementary Theory and Problems", CBS Publishers & Distributors, 3rd Edition, New Delhi, 2004.

COURSE OUTCOMES:
At the end of the course, the students will be able to
CO1: draw the shear force, bending moment and stress distribution for statically determinate beams.
CO2: sketch the slope and deflection curves for various types of indeterminate beams.
CO3: determine the deflection and sketch the deflected curve for various types of indeterminate beams
CO4: apply the various energy principles and theorems for the computation of deflection in beams, plane trusses and rigid frames.

CO5: Elucidate the concepts for the behaviour of axially loaded members and solve for buckling under different boundary conditions.

Board of Studies (BoS) :
16th BoS of CE held on 5.01.2022

Academic Council:
18th Academic Council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	H		M										M	M	
CO2	H		M										M	M	
CO3	H		M										M	M	
CO4	H		M										M	M	
CO5	H		M										M	M	

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

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

SDG - 11 : Make cities and human settlements inclusive, safe, resilient and sustainable

Statement: Analysis of structures is more essential to ensure safe and sustainable building.

CED 2102   **MECHANICS OF FLUIDS**   L   T   P   C

SDG: 6   3   0   0   3

COURSE OBJECTIVES:

COB1: To impart understanding of key concepts and fundamental principles pertaining to fluid behavior.

COB2: To provide sufficient knowledge to understand the basic concepts of fluid flow.

COB3: To impart the basic knowledge on the dynamics of fluids and flow through pipes.

COB4: To expose to the significance of boundary layer theory and its applications.

COB5: To develop the basic knowledge on the dimensional analysis and model study.

**MODULE I   FLUID   PROPERTIES   AND   PRESSURE   10
                 MEASUREMENTS**

Dimensions and units - Properties of Fluids - Ideal and Real fluid - Definition of pressure - Pressure at a point- Pascal's law- Absolute and Gauge pressure - Measurement of pressure - Simple and Differential Manometer theory and problems - Pressure gauges.

MODULE II   FLUID STATICS AND FLUID KINEMATICS   10

Fluid Statics - Hydrostatic law - Definition of total pressure, Center of pressure, Metacentric height, Buoyant force –Problems on hydrostatic force and depth of center of pressure on plane surfaces and submerged surfaces (Vertical, Inclined and curved).

Fluid Kinematics – Velocity and Acceleration- Stream, Streak and Path lines – Classification of flows – Continuity equation (one-, two- and three-dimensional forms) – Stream and Potential functions – Flow nets.

MODULE III   FLUID DYNAMICS   9

Euler and Bernoulli's equations – Application of Bernoulli's equation – Venturimeter–Orifice meter- Laminar flow through pipes– Hagen Poiseuille equation – Turbulent flow – Darcy-Weisbach formula – Major and minor losses of flow in pipes – Pipes in series and in parallel – Moody diagram.

MODULE IV   BOUNDARY LAYER   8

Definition of boundary layer – Thickness and classification –Displacement

and momentum thickness – Separation of boundary layer – Development of laminar and turbulent flows in circular pipes.

MODULE V   SIMILITUDE AND MODEL STUDY   8
Dimensional Analysis – Rayleigh's method, Buckingham's Pi- theorem – Similitude and Models- Dimensionless numbers – Scale effect and Distorted models

L –45; Total Hours– 45

TEXT BOOKS:
1. Bansal R.K., "A textbook of Fluid mechanics and hydraulic machines", Laxmi Publications (P) Ltd., New Delhi, 10th Edition, 2019.
2. Modi, P.N. and Seth, S.M.," Hydraulics and Fluid Mechanics including Hydraulics Machines", 21st Edition, Standard Book House, New Delhi, 2018.
3. Som. S.K., Gautam Biswas and Chakraborty. S., "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill Education Pvt. Ltd., 2012.

REFERENCES:
1. Jagadish Lal., "Fluid Mechanics & Hydraulic with Computer Applications", Metropolitan Publication, 9th Reprint edition, 2008.
2. Molykutty, M.V., "Fluid Mechanics and Machinery", D1 Publications, Chennai, 2008.
3. Munson, Okiishi , Huebsch , and Rothmayer., "Fluid Mechanics-SI Version", 7th Edition Paperback, Wiley publication, 2015.
4. Ramamrutham.S. "Hydraulics Fluid Mechanics and Fluid Machines," 9th Edition, Dhanpat Rai Publication, 2014.

COURSE OUTCOMES:
At the end of the course the students will be able to
CO1: describe fluid properties, forces causing flow and will be able to solve problems involving fluid properties and fluid pressure measurements.
CO2: assess the knowledge related to hydrostatic forces acting on the floating bodies and analyze the flow using principles of fluid kinematics.
CO3: solve fluid problems using principle of fluid dynamics, estimate losses in pipelines and analysis of pipes connected in series and parallel.
CO4: demonstrate the concept of boundary layer and its application to find the drag force excreted by the fluid on the flat solid surface.
CO5: formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performances of prototype by model studies.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	H	M	L	L	L	L	M	L	L	L	L	M	L	L	L
CO2	H	M	L	L	L	L	M	L	L	L	L	M	L	L	L
CO3	H	M	H	L	L	M	H	L	L	L	L	H	L	L	M
CO4	H	M	M	M	L	L	M	L	L	L	L	H	L	L	L
CO5	H	M	M	M	L	L	H	L	L	L	L	H	L	L	L

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

SDG 6: Clean, accessible water for all is an essential part of the world we want to live in.

Understanding the development of sustainable water supplies by means of design and construction of efficient water supply and distribution system.

CED 2103 **CONCRETE TECHNOLOGY** **L T P C**

SDG: 11 **3 0 0 3**

COURSE OBJECTIVES: The main objective of this course is to impart adequate knowledge on

COB1:significance of concrete constituent materials

COB2:workability of concrete and concrete mix design

COB3:hardened concrete properties and its significance

COB4: durability properties of concrete

COB5: different types of concrete currently used in the construction projects

MODULE I	CONCRETE CONSTITUENT MATERIALS AND WORKABILITY	9

Overview and significance of concrete constituent materials – Cement : chemical composition and compounds, hydration process, microstructure of concrete–Workability : water-cement ratio, influencing factors, site and laboratory methods to determine workability – Mineral and chemical admixtures : overview

MODULE II	CONCRETE MIX DESIGN	9

Manufacture of concrete: Construction practices to be followed in site – Concrete Mix Design: significance, salient parameters, mix design as per Indian Standards and American Concrete Institute method, validation of mix design, fresh concrete properties.

MODULE III	HARDENED CONCRETE PROPERTIES	9

Hardened concrete properties: overview and significance - compressive strength, flexural strength, splitting tensile strength, modulus of elasticity, bond strength, creep and shrinkage: test methods as per Indian standards, estimation of strength properties – NDT techniques for hardened concrete strength assessment : overview.

MODULE IV	DURABILITY PROPERTIES OF CONCRETE	9

Sustainable construction – Durable concrete – life cycle cost benefits – Mechanisms affecting durability of concrete: physical mechanisms and chemical mechanisms : overview – Significance of proper selection of construction materials, mix design and good construction practices – Tests to assess durability of concrete : water absorption, water permeability, water

sorptivity, rapid chloride penetration test, accelerated corrosion test – test procedures and estimation methods.

MODULE V   CONCRETE FOR SPECIAL APPLICATIONS   9

High performance concrete – fibre reinforced concrete – polymer modified concrete – shotcrete – self compacting concrete

L – 45 ; TOTAL HOURS – 60

TEXT BOOKS:

1.   Shetty.M.S., and A.K. Jain "Concrete Technology (Theory and Practice)", S. Chand and Company Ltd.,2010.

2.   Gambhir.M.L., "Concrete Technology", 5th Edition, Tata McGraw Hill Education, 2017

REFERENCES:

1.   Kumar Mehta. P. and Paulo J.M. Monteiro., "Concrete: Microstructure, Properties, and Materials"4th Edition, McGraw Hill Education (India) Pvt. Ltd., 2014.

2.   Brooks, J.J. and Neville, A.M., "Concrete Technology", Pearson, 2019.

3.   Santhakumar, A.R., "Concrete Technology" Oxford, 2006.

4.   IS 456 (2000) R 2005, "Plain and Reinforced Concrete – Code of Practice", Bureau of Indian Standards, New Delhi.

5.   IS 10262 (2009), "Guidelines for Concrete Mix Design Proportioning", Bureau of Indian Standards, New Delhi.

6.   ACI 211.1-19 (R 2002), "Standard Practice for Selecting Proportions for Normal, Heavy weight, and Mass Concrete" American Concrete Institute, Detroit, USA.

7.   IS 516 (1959) R 2004, "Method of Tests for Strength of Concrete", Bureau of Indian Standards, New Delhi.

8.   IS 2770 – 1 (1967) R 2007, "Methods of Testing Bond in Reinforced Concrete, Part I : Pull-out test" Bureau of Indian Standards, New Delhi.

9.   IS 5816(1999) R 2004, "Method of Test Splitting Tensile Strength of Concrete", Bureau of Indian Standards, New Delhi.

10. ASTM C1585-20, "Standard Test Method for Measurement of Rate of Absorption of Water by Hydraulic-cement Composites", American Society for Testing and Materials, Pennsylvania, USA.

11. IS 3085 (1965) R 2002, "Method of Test for Permeability of Cement Mortar and Concrete", Bureau of Indian Standards, New Delhi.

12. ASTM C 1202-12, "Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration", American Society for

Testing and Materials, Pennsylvania, USA.

COURSE OUTCOMES: On completion of the course the student will be able to

CO1: describe the composition and compounds of cement, hydration process and workability of concrete.

CO2: perform mix design of concrete as per Indian Standards and ACI method

CO3: describe the hardened concrete properties including its test method as per Indian Standard

CO4: describe the durability properties of concrete including its test method as per Indian Standard / ASTM

CO5: specify and describe the type of concrete for special applications.

Board of Studies (BoS) :   **Academic Council:**
16th BoS of Civil held on 05.01.2022   18th AC held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1											L		H		
CO2											M		H		
CO3						M	M				M		H		
CO4						M	M				M		H		
CO5						M	M				H		H		

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

SDG 11: Make cities and human settlements inclusive, safe, resilient and sustainable

Designing of durable concrete by properly understanding the properties of concrete constituent materials, expected strength, exposure conditions and application; make the human settlements safe and resilient and leads to sustainable development.

CED 2104	**WATER AND WASTEWATER**	L	T	P	C
SDG: 6	**ENGINEERING**	**3**	**0**	**2**	**4**

COURSE OBJECTIVES:

The objectives of the course are to impart knowledge on

COB1: The population forecasting, water sources, intake structures, water quality and its treatment

COB2: The advanced water treatment methods, water storage facilities and distribution network

COB3: The sewerage systems, estimation of wastewater flows & storm runoff, wastewater characterization and its primary treatment

COB4: The secondary treatment of wastewater

COB5: The methods for wastewater disposal & sludge handling.

MODULE I	**WATER TREATMENT**	**9**

Design Period - Population forecasting - Types of water demand -Sources of water - Intakes - Characteristics of water - Standards for drinking water - Principle, function and design of water treatment units - sedimentation, coagulation & flocculation, Filtration – theory & principle of disinfection methods.

MODULE II	**ADVANCED WATER TREATMENT, STORAGE & DISTRIBUTION**	**9**

Water softening – Iron, Manganese and Phosphorus removal, Defluoridation – Desalination - Membrane filtration - Water storage facilities – Distribution networks & analysis.

MODULE III	**PRIMARY TREATMENT OF WASTEWATER**	**9**

Sewerage systems - Sewage flow estimation - Storm runoff estimation - Sewer materials - Hydraulics of flow in sewer - Sewer appurtenances – Characteristics of sewage - Unit operations and processes - Primary treatment – Principles, functions and design of sewage treatment units – Screens – Grit chamber.

MODULE IV	**SECONDARY TREATMENT OF WASTEWATER**	**9**

Introduction to Aerobic and Anaerobic treatment process - Functions and design of Activated sludge process and trickling filter – Principles and functions of Membrane Bioreactor, Sequential batch reactor, Waste stabilisation pond, UASB reactor - Onsite sanitation - septic tanks

**MODULE V   WASTEWATER DISPOSAL & SLUDGE   9
                TREATMENT**

Standards for disposal into water bodies – Self-purification of river - Oxygen sag curve – Sewage farming and methods - Sludge thickening & Digestion – Biogas recovery – Sludge conditioning and Dewatering – Sludge drying bed.

PRACTICALS

List of experiments

1. Determination of pH and Turbidity
2. Determination of Dissolved oxygen
3. Determination of Solids (Total, Suspended and Dissolved solids)
4. Determination of Conductivity
5. Determination of Sodium, Potassium and Calcium
6. Determination of Biochemical Oxygen Demand (BOD)
7. Determination of Chemical Oxygen Demand (COD)
8. Determination of Hardness
9. Determination of Chlorides and Residual Chlorine
10. Determination of Optimum Coagulant Dosage by Jar Test
11. Determination of Alkalinity
12. Determination of Nitrate
13. Determination of Phosphate
14. Heavy metals determination using AAS (Demo)

L – 45; P – 30; Total Hours – 75

TEXT BOOKS:

1. GargSK, "Water Supply Engineering", Khanna Publications, 27th Edition, 2015
2. Mackenzie L. Davis, Ph.D., P.E., BCEE. Water and Wastewater Engineering: Design Principles and Practice, Second Edition (McGraw-Hill Education: New York, 2020.
3. Metcalf and Eddy, "Wastewater Engineering Treatment, Disposal and Reuse", Tata McGraw Hill, 2007.
4. Modi.P.N., "Sewage Treatment and Disposal and Wastewater Engineering", Standard Book House, New Delhi, 2008

REFERENCES:

1. APHA., "Standard methods for the examination of Water and Waste Water", American Public Health Association, United States, 2013.
2. Bureau of Indian Standards, "Indian Standard Drinking water — Specification-IS10500: 2012, New Delhi.
3. Water and Wastewater analysis – Manual, Central Pollution Control Board, New Delhi, 2011.

COURSE OUTCOMES:

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

CO1: forecast population, estimate quantity of water demand, characterize water quality and design treatment units

CO2: describe advanced treatments for water, water storage facilities and analyze distribution network

CO3: explain the sewerage systems, estimate wastewater flows & storm runoff, characterize quality of wastewater and design the primary wastewater treatment units

CO4: describe the secondary treatment of wastewater

CO5: describe the methods for wastewater disposal & sludge handling.

Board of Studies (BoS) :

16th BoS of Civil held on 05.01.2022.

Academic Council:

18th Academic Council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	-	-	M	-	-	L	H	L	M	M	-	M	L	-	H
CO2	-	-	L	-	-	-	H	L	M	M	-	M	L	-	H
CO3	-	-	M	-	-	L	H	L	M	M	-	M	L	-	H
CO4	-	-	M	-	-	-	H	L	M	M	-	M	L	-	H
CO5	-	-	L	-	-	M	H	L	M	M	-	M	L	-	H

Note: L - Low Correlation   M -Medium Correlation   H - High Correlation

SDG No.6 : Clean Water and Sanitation

The understanding of water and wastewater treatment leads to the development of sustainable technologies for treatment and management of water and wastewater.

CED 2105	**TRANSPORTATION**	L	T	P	C
SDG: 8	**ENGINEERING**	3	0	0	3

COURSE OBJECTIVES:
The Objectives of the course are
COB1: To impart knowledge on urban transportation planning
COB2: To understand the highway engineering principles
COB3: To impart knowledge on the concepts of geometric design of highways
COB4: To gain knowledge on various types of intersections and its geometric design
COB5: To explain the modern techniques used in urban transportation planning

MODULE I INTRODUCTION 8
Role of Transportation Engineering; Modes of transportation- Their importance and limitations- Urban Transportation Planning Process, Urban Travel and Transportation Systems Characteristics, Function and form of urban structures, services, classification of urban centers, growth patterns, urban transport problems, Transport Behavior of Individuals and Households, Land use/ Transportation systems, land value and congestion, access and business migration.

MODULE II HIGHWAY ENGINEERING 8
Importance of Highway Transportation; Highway Planning- Principle of Highway Planning - Highway Alignment Requirements, Engineering Surveys for Highway locations. Road developments -Jayakar Committee and Recommendations, Twenty year Road Development Plan, IRC, Institutions - HRB, NHAI, MORTH and CRRI) - Financing, Privatization of Highways, Highway Alignment Requirements, Engineering Surveys for Highway locations.

MODULE III GEOMETRIC DESIGN OF HIGHWAYS ENGINEERING 12
Classification and Cross section of Urban and Rural Roads (IRC),Highway Cross sectional Elements – Right of way, Carriage way, Road Width, Camber, Kerbs, Shoulders and Footpaths (IRC Standards), Sight distances – Factors affecting sight distances – PIEV theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance (Derivations and Problems in SSD
and OSD), Design of Horizontal Alignments – Super elevation, Widening of pavements – Gradient – Horizontal Curves and Transition Curves (Derivation of Formulae and Problems) - Design of Vertical Alignments, Geometry design of hill roads – hairpin bends

MODULE IV   INTERSECTIONS   8

Intersections – Type of intersections- Basic considerations – simplicity – uniformity – Maneouvre Elements – Separation of conflict points – Design Elements – Design Speed – Intersection Curves – Super elevation for curves at Intersection – Intersection Sight Distance. Rotary and Signalized Intersections grade separated interchanges such as flyovers, underpasses, overpasses, concept of Integrated Inter Model transit system.

MODULE V   MODERN URBAN TRANSPORTATION   9

Introduction to Urban Freight Transportation and Urban Mass Transportation Systems. Characteristics of buses, bicycles, Para transit, rapid transit, Traffic Restraint Techniques and methods. Classification, mass and rapid transit system, Introduction to Intelligent Transportation System (ITS), Public Transport policy, intermediate.

L- 45; Total Hours – 45

TEXT BOOKS:

1. Johnson victor, S.Ponnuswamy, Urban Transportation, Planning, Operation and Management, McGraw-Hill Pvt. Ltd, 2012.
2. Kadiyali.L.R., Principles   and   practice of highway engineering Khanna Technical Publications, Delhi, 2005.
3. Khanna.K and Justo CEG., Highway engineering, 10th edition Khanna Publishers, 2010.

REFERENCES:

1. Johnson Victor and S. Ponnuswamy., "Urban Transportation: Planning, Operation and Management" McGraw-Hill Education Private Limited2012.
2. Sigurd Grava, "Urban   Transportation   Systems",   McGraw   Hill Professional,2013.

COURSE OUTCOMES:

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

CO1: describe the urban transport planning process and various Characteristics of urban forms

CO2: ascertain knowledge on highway alignment requirements and engineering surveys for highway locations

CO3: explain geometric design of various cross sectional elements and factors affecting the sight distances

CO4: demonstrate the constructions of intersection design and to know the concept of integrated inter modal transit system.

CO5: compile the modern urban transportation such as Para transit, rapid transit and intelligent transportation system.

Board of Studies (BoS) :
16thBoS of Civil held on 05.01.2022

Academic Council:
18th Academic Council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	L	L	M	L	L	L	L	M	L	L	L	L	L	L	L
CO2	L	L	M	L	L	L	M	M	L	-	L	L	L	L	L
CO3	L	L	M	L	L	L	M	M	L	L	L	L	L	L	L
CO4	L	L	L	L	L	L	M	L	L	L	-	L	L	L	L
CO5	L	L	L	L	L	L	M	L	L	L	-	L	L	L	L

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

SDG 8 : Decent Work and Economic Growth

The transportation engineering Promote sustained, inclusive and sustainable economic growth.

| CED 2106 | **CONCRETE AND HIGHWAY** | L | T | P | C |
| SDG: 11 | **LABORATORY** | 0 | 0 | 2 | 1 |

COURSE OBJECTIVES: The objective of the course is to impart hands on training on

COB1: methods of measuring workability of fresh concrete

COB2: concrete mix design as per Indian and ACI method

COB3: testing hardened concrete samples

COB4: testing of aggregates used for Highway Engineering

COB5: testing and quality assurance of bitumen used for Highway Engineering

MODULE I   FRESH CONCRETE PROPERTIES   6

Concrete constituent materials and performance tests as per Indian Standards: Overview – Workability of concrete : Slump test, compaction factor test, flow table test and Vee Bee consistometer test – Influence of water-cement ratio on workability.

MODULE II   CONCRETE MIX DESIGN   6

Concrete mix design as per Indian Standards and ACI committee method for the given materials and set variables – validation of mix design.

MODULE III   HARDENED CONCRETE PROPERTIES   6

Compressive strength test on cubes and cylinder specimen, flexural strength test on concrete prism, splitting tensile strength test on concrete cylinder, Young's modulus of concrete : Testing as per relevant Indian Standards and interpretation of results.

MODULE IV   AGGREGATES FOR HIGHWAY APPLICATION   6

Materials used in Highway Engineering and performance tests as per Indian Standards : Overview – Testing on aggregates : Impact strength - crushing strength - abrasion resistance - water absorption

MODULE V   PROPERTIES OF BITUMEN   6

Grades of Bitumen: Overview. Tests on Bitumen - Penetration, Softening point, Ductility, Specific gravity, Binder content in bituminous mixture and Marshal stability test.

L – 30 ; TOTAL HOURS – 30

TEXT BOOKS:

1. SanthaKumar,A.R.,"ConcreteTechnology",Oxford University Press,Chennai 2007.
2. Shetty, M.S., "Concrete Technology – Theory and Practice", S. Chand & Company Limited, New Delhi,2008

REFERENCES:

1. IS 1199 (1959) R 2004, "Methods of Sampling and Analysis of Concrete", Bureau of Indian Standards, New Delhi.
2. IS 10262 (2009), "Guidelines for Concrete Mix Design Proportioning", Bureau of Indian Standards, New Delhi.
3. ACI 211.1-19 (R 2002), "Standard Practice for Selecting Proportions for Normal, Heavy weight, and Mass Concrete" American Concrete Institute, Detroit, USA.
4. IS 516 (1959) R 2004, "Method of Tests for Strength of Concrete", Bureau of Indian Standards, New Delhi.
5. IS 5816(1999) R 2004, "Method of Test Splitting Tensile Strength of Concrete", Bureau of Indian Standards, New Delhi.
6. IS 383 (1970), "Specification for coarse and fine aggregate from natural sources for concrete", Bureau of Indian Standards, New Delhi.
7. IS 2386 - PartI (1963), "Methods of test for aggregates for concrete-Particle size and shape", Bureau of Indian Standards, New Delhi.
8. IS 1203 (1978), "Determination of penetration of bitumen", Bureau of Indian Standards, New Delhi.
9. IS 1205 (1978), "Determining softening point of bitumen", Bureau of Indian Standards, New Delhi.
10. IS 1208 (1978), "Determination of ductility of bitumen", Bureau of Indian Standards, New Delhi.

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

CO1: Find workability of concrete for the give set of materials and conditions

CO2: Perform concrete mix design as per Indian Standards and ACI method for the given materials and validation

CO3: Assess hardened concrete properties by conducting tests as per Indian standards.

CO4: Determine the properties of materials used in highway engineering as per Indian Standards

CO5: Perform the tests to determine the properties of Bitumen as per Indian Standards

Board of Studies (BoS) :

16ᵗʰBoS of Civil held on 05.01.2022

Academic Council:

18ᵗʰ AC held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1													M		
CO2							M				M		H		
CO3					M						M		H		
CO4							M				M		H		
CO5							M				H		H		

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

SDG 11 : Make cities and human settlements inclusive, safe, resilient and sustainable

Making of durable concrete by properly understanding the properties of concrete constituent materials, expected strength, exposure conditions and application; and Building Highway Infrastructure by proper understanding of materials and its properties make the human settlements safe and resilient and leads to sustainable development.

GED 2101	**ESSENTIAL SKILLS AND APTITUDE FOR**	L	T	P	C
SDG: 17	**ENGINEERS**	0	0	2	1

COURSE OBJECTIVES:

COB1:To enable them to make effective business presentations

COB2:To train them to participate in group discussions

COB3: To enhance the problem-solving skills

COB4: To train students in solving analytical problems

MODULE I   ORAL DISCOURSE   07

Importance of oral communication-verbal and non-verbal communication, Presentation Strategies- one minute presentation (using Audacity/vocaro) - Effective listening skills, listening for specific information

MODULE II   VERBAL COMMUNICATION   08

Understanding negotiation, persuasion & marketing skills - Listening to short conversations & monologues - Group Discussion techniques - Role plays - Interview techniques

MODULE III   BASIC NUMERACY   08

Simplification and Approximation – Competitive Examination Shortcut Techniques - Number Systems - Simple and Compound Interest-Progression

MODULE IV   ANALYTICAL COMPETENCY   07

Blood Relations – Clocks and Calendars – Coding and Decoding – Analytical Reasoning(Linear Arrangement, Circular Arrangement, Cross Variable Relationship and Linear Relationship)– Directions .

P – 30; Total Hours- 30

REFERENCES:

1. Whitby, Norman (2014). Business Benchmark: Pre-Intermediate to Intermediate. Cambridge University Press, UK
2. Swan, Michael (2005). Practical English Usage, Oxford University Press
3. Bhattacharya. Indrajit (2008). An Approach to Communication Skills, DhanpatRai& Co., (Pvt.) Ltd. New Delhi.
4. Tyra .M, Magical Book On Quicker Maths, BSC Publishing Company Pvt. Limited, 2009
5. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Limited, 2017

6. R. S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. Chand Limited, 2010

7. Khattar Dinesh, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, 3e, Pearson India, 2016

8. Rajesh Verma, Fast Track Objective Arithmetic Paperback, Arihant Publications (India) Limited, 2018

9. Arun Sharma Teach Yourself Quantitative Aptitude Useful for All Competitive Examinations, McGraw Hill Education (India) Pvt. Limited, 2019.

COURSE OUTCOMES:

CO1: Make effective business presentations

CO2: Speak English intelligibly, fluently and accurately in group discussions

CO3: To apply the various problem-solving techniques

CO4: Understand and solve aptitude problem

Board of Studies (BoS) :
13[th]BoS of the Department of English held on 17.6.2021

Academic Council:
17th AC held on 15.07.2021

	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	PSO 3
CO1										H					
CO2									M	H					
CO3				L	L										
CO4		M		L											
CO5															

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

SDG 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development.

Statement: This course ensures capacity building and skills development requisite for implementing global partnership.

SEMESTER IV

CED 2201	MECHANICS OF SOILS	L	T	P	C
SDG: 11		3	0	2	4

COURSE OBJECTIVES:

The objectives of the course are

COB1: To familiarize the students with geotechnical terminology and impart knowledge on index properties and hydraulic properties of soil.

COB2: To provide knowledge on the effective stress behavior and stress distribution for different loading condition.

COB3: To understand the concepts in compaction and consolidation of soil.

COB4: To enable the students to determine the shear strength of the soil.

COB5: To provide an understanding on slope stability in soil.

MODULE I	INDEX PROPERTIES AND HYDRAULIC PROPERTIES OF SOILS	12

Introduction: Nature of Soil - Problems with soil - Index properties: Phase relation - Sieve analysis - Sedimentation analysis- Atterberg limits – Field Density – Classification of soils for engineering purpose - Hydraulic properties: Soil water - Various forms- Influence of clay minerals - Capillary rise - Permeability - Darcy's Law- Permeability measurement in the laboratory – Introduction to Flow nets – Simple problems.

MODULE II	EFFECTIVE STRESS AND STRESS DISTRIBUTION IN SOIL	8

Effective stress concepts in soil – Total, neutral and effective stress distribution in soil - Stress distribution in soil media - Boussinesque formula- stress due to line load, circular and rectangular loaded area - approximate methods - Use of influence charts - Westergaard equation for point load.

MODULE III	COMPACTION AND CONSOLIDATION	8

Soil compaction - factors affecting compaction - field compaction methods and monitoring – Consolidation - Terzaghi's one dimensional consolidation theory – Consolidation Settlement - Problems - Laboratory consolidation test - Field consolidation curve.

MODULE IV	SHEAR STRENGTH	8

Shear strength of cohesive and cohesion less soils - Mohr - Coulomb failure theory

- Saturated soil and unsaturated soil (basics only)-Strength parameters - Measurement of shear strength, direct shear, triaxial compression, UCC and Vane shear tests-types of shear tests based on drainage and their applicability.

MODULE V   SLOPE STABILITY   9

Slope failure mechanisms - Modes of failure- Infinite slopes - Finite slopes - Total and effective stress analysis - Stability analysis for purely cohesive and c-φ soils - Friction circle method - Stability number - Slope protection measures.

PRACTICALS

List of Experiments

1. Specific gravity of soil grains
2. Grain size distribution by Sieve analysis and Hydrometer analysis,
3. Relative density of sands
4. Atterberg limits test.
5. Field density test (Core cutter and sand replacement methods).
6. Permeability determination (constant head and falling head methods)
7. Determination of moisture - density relationship using Standard Proctor Compaction test.
8. One dimensional consolidation test (Determination of co-efficient of consolidation only).
9. Determination of shear strength parameters - Direct shear test on cohesion less soil, Unconfined Compression test on cohesive soil, Triaxial compression test and Vane shear test.

L – 45 ; P – 30 ; Total Hours– 75

TEXT BOOKS:

1. Gopal Ranjan and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers, New Delhi, 3rd edition, 2016.
2. Iqbal H Khan., "A text book of Geotechnical Engineering", Prentice Hall of India, New Delhi, 3rd edition, 2012.
3. Punmia, B.C, Ashok Kumar Jain and Arun Kumar Jain., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 17th edition, 2017.
4. Venkatramaiah, C., "Geotechnical Engineering", New Age International Publishers, New Delhi, 6th edition, 2018.

REFERENCES:

1. Coduto, D.P, Man-chu Ronald Yeung and William A Kitch., "Geotechnical Engineering Principles and Practices", Prentice Hall of India Private Limited, New Delhi, 2010.

2. Das, B.M. and Khaled Shoban., "Principles of Geotechnical Engineering", 9th Edition, Thomas Brooks/ Cole Publishing Company, 2016.

3. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations – Basic Geotechniques", 7th Edition, Prentice-Hall, New Jersey, 2014.

4. Muni Budhu., Soil Mechanics and Foundations., 3rd edition, John Willey & Sons, Inc., New York, 2010.

COURSE OUTCOMES:

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

CO1: determine the index properties and hydraulic properties of soil and classify soil for engineering purpose.

CO2: analyze effective stress and stress behaviour of soil under various loading condition in soil.

CO3: assess consolidation settlement and incorporate various compaction methods.

CO4: ascertain the behaviour of soil based on shear strength parameters.

CO5: analyze the stability of soil and suggest suitable protection measures

Board of Studies (BoS) :
16th BoS of CIVIL held on 05.01.2022

Academic Council:
18th Academic Council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	M	M	L			M	M			L	L	M	H		
CO2	H	L	L			L	M			L	L	L	M		
CO3	H	L	L			L	M			L	L	L	H		
CO4	H	L	L			L	L			L	L	L	H		
CO5	M	L	M			M	M				L	L	M	L	

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

SDG 11 : Make cities and human settlements inclusive, safe, resilient and sustainable.

Statement : The impart of knowledge on basic soil properties and their behavior under different stress conditions helps in designing an economical and safe foundation leading to construction of resilient infrastructure.

CED 2202   STRUCTURAL ANALYSIS – I   L   T   P   C

SDG: 9 & 11   3   0   0   3

COURSE OBJECTIVES:

COB1: To provide in-depth knowledge of the analysis of structures by the slope - deflection method.

COB2: To impart knowledge on the analysis of beams and frames by moment distribution method.

COB3: To understand the fundamental concepts of beams curved in plan.

COB4: To provide knowledge on the analysis of beams using moving loads and influence lines.

COB5: To enable the students to understand the influence lines for indeterminate structures.

MODULE I   SLOPE DEFLECTION METHOD   9

Continuous beams and rigid frames (with and without sway) – Symmetry and ant symmetry - Simplification for hinged end - Support displacements.

MODULE II   MOMENT DISTRIBUTION METHOD   9

Stiffness and carry-over factors - Distribution and carryover of moments - Analysis of continuous Beams - Plane rigid frames with and without sway - Naylor's simplification.

MODULE III   BEAMS CURVED IN PLAN   9

Introduction to curved beams - Analysis of beams curved in plan- Circular arc cantilever – Semi-circular beams fixed at two ends and subjected to central concentrated load - Circular ring beams.

MODULE IV   MOVING LOADS AND INFLUENCE LINES FOR   9
                    DETERMINATE STRUCTURES

Influence lines for reactions in statically determinate structures – Influence lines for member forces in pin-jointed frames – Influence lines for shear force and bending moment in beam sections – Calculation of critical stress resultants due to concentrated and distributed moving loads.

MODULE V   INFLUENCE LINES FOR INDETERMINATE   9
                    STRUCTURES

Muller Breslau's principle – Application of Muller Breslau's principle to determinate

beams and continuous beams.

L – 45; Total Hours – 45

TEXT BOOKS:

1. Bhavikatti, S. S., "Structural Analysis - I, Vikas Publishing House Pvt. Ltd., 4th Edition, New Delhi, 2011.
2. Devdas Menon, "Structural Analysis", Alpha Science International Ltd., 2nd Edition, New Delhi, 2017,
3. Muthu, K. U., Azmi Ibrahim, Vijayanand, M., and Maganti Janardhana, "Basic Structural Analysis", I.K. International Publishing House Pvt. Limited, 3rd Edition, New Delhi, 2017.
4. Salah Khalfallah, "Structural Analysis 2: Statically Indeterminate Structures", John Wiley & Sons, New York, 2018.

REFERENCES:

1. Bhavikatti, S. S., "Structural Analysis - II, Vikas Publishing House Pvt. Ltd., 4th Edition, New Delhi, 2013.
2. Gambhir, M.L., "Fundamentals of Structural Mechanics and Analysis", Publisher, PHI Learning Pvt. Ltd., New Delhi, 2011
3. Das Madan Mohan, Das Bhargab Mohan and Saikia Mimi Das, "Structural Analysis", PHI Learning Pvt. Ltd., New Delhi, 2011.
4. Vaidyanathan, R., and Perumal, P, "Structural Analysis, Volume 2", Laxmi Publications, 2nd Edition, New Delhi, 2006.

COURSE OUTCOMES:

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

CO1: plot the bending moment diagram and shear force diagram of indeterminate structures by using the slope deflection method.

CO2: construct the bending moment diagram and shear force diagram of indeterminate structures by using the moment distribution method.

CO3: analyse the curved beams subjected to loads in the plane of curvature.

CO4: valuate and construct statically determinate structures from the influence lines.

CO5: generate the influence line diagram for continuous beam using Muller Breslau's principle.

Board of Studies (BoS):	Academic Council:
16th BoS of CE held on 5.1.2022	18th Academic Council held on 24.02.2022

	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	PSO2	PSO3
CO1	H	H	M		L								M	H	
CO2	H	H	M		L								M	H	
CO3	H	H	M		L								M	H	
CO4	H	H	M		L								M	H	
CO5	H	H	M		L								M	H	

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

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

SDG - 11 : Make cities and human settlements inclusive, safe, resilient and sustainable

Statement : Analysis of structures is more essential to ensure safe and sustainable building.

CED 2203   **STRUCTURAL CONCRETE DESIGN**   L   T   P   C

SDG: 9 & 11   3   0   2   4

COURSE OBJECTIVES:

COB1: To introduce the fundamental concepts of reinforced concrete materials with an emphasis on the various methods of design and also design the beam under flexure & shear

COB2:To impart knowledge to students about the design of concrete one-way & two-way slabs as per Indian Standards.

COB3: To design the short and slender columns subjected to axial load as well as combined axial load and bending moment.

COB4: To be familiar with various types of footings and design the foundation for RC structures.

COB5: To understand the concepts of structural behaviour of staircases and design the staircase for buildings.

MODULE I   **STRUCTURAL RC DESIGN CONCEPTS & DESIGN OF**   **9**
                     BEAMS

Objectives of structural design – Concept of the elastic method, ultimate load method and limit state method – Advantages of Limit State method over other methods – Limit State Design philosophy as per IS Code recommendations - Fundamental assumption –Linear elastic analysis of composite sections – Flexural and shear behaviour of reinforced concrete – Analysis and Design of singly and doubly reinforced rectangular and flanged sections – Behaviour and design of torsion – Mechanisms of bond resistance – Flexural bond – Anchorage bond.

MODULE II   **DESIGN OF SLABS**   **9**

Behaviour of slabs spanning in one and two directions - Design of one way simply supported and continuous slabs - Design of two-way slabs for various edge conditions.

MODULE III   **DESIGN OF COLUMNS**   **9**

Classification of columns – Behaviour of RC columns - Design of short columns under axial compression, combined axial compression with uniaxial and biaxial bending.

MODULE IV   **DESIGN OF FOOTINGS**   **9**

Types of footings – Pressure distribution under footings   - Design of Isolated rectangular footings with concentric column loads – Design of Isolated rectangular

footings with eccentric column loads - Design of circular footings
with concentric column loads - Design of combined rectangular footings.

MODULE V   DESIGN OF STAIRCASES   9

Dimensioning and Types of staircases – Structural behaviour of staircases – Loads
on staircases - Design of stair slabs spanning transversely and longitudinally.

PRACTICALS

List of Exercises

1. Introduction to STAAD.Pro, Model generations, Assigning Loads, Creating Load
   Combinations, Analysis and Design
2. Analysis and Design of a simply supported beam
3. Analysis and Design of a continuous beam
4. Analysis and Design of plane frames with two bay five-storey (G+4)
5. Analysis and Design of space frames with single-bay two-storey (G+1)
6. Design of foundation for the space frames with single-bay two-storey (G+1)
7. Design of staircase with single-bay two-storey (G+1)

L – 45; P – 30 ; Total Hours – 75

TEXT BOOKS:

1. Krishna Raju, N., "Design of RC Structures", CBS Publishers and
   Distributors, New Delhi, 2008.
2. Pillai, S.U., and Wight, R.G., "Reinforced Concrete Design", Tata McGraw Hill
   Publishing Company Ltd., New Delhi, 2016.
3. Subramanian, N., "Design of Reinforced Concrete Structures", Oxford
   University Press, New Delhi, 2013.
4. Sarma, T.S., "Design of R.C.C. Buildings using Staad Pro V8i with Indian
   Examples: Static and Dynamic Methods", Educreation Publishing, New Delhi,
   2017.
5. Sham Tickoo, "Exploring Bentley STAAD.Pro V8i (SELECT series 6)",
   CADCIM Technologies, USA, 2017.
6. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of
   India, New Delhi, 2008.

Codes /Standards

1. IS 456 :2000, Indian Standard for Plain and Reinforced Concrete-
   Code of Practice,BIS, New Delhi
2. SP:16 : Design Aids for Reinforced Concrete to IS : 456-1978, BIS,
   New Delhi
3. SP:34 : Handbook Concrete Reinforcement and Detailing, BIS, New
   Delhi

REFERENCES:

1. Bandyopadhyay. J.N., "Design of Concrete Structures", Prentice Hall of India Pvt. Ltd., New Delhi, 2008.
2. Ghosh Karuna Moy, "Practical Design of Reinforced Concrete Structures", PHI Learning Pvt. Ltd., New Delhi, 2010.
3. M. N. Hassoun, M.N and Akthem Al-Manaseer, "Structural Concrete: Theory and Design", Sixth Edition, John Wiley & Sons, New York, 2015.Syed Mehdi Ashraf, "Practical Design of Reinforced Concrete Buildings", CRC Press, Florida, 2017.
4. Wight, J.K., "Reinforced Concrete: Mechanics and Design", Pearson, 7thEdition, London, 2016.

COURSE OUTCOMES:

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

CO1: demonstrate various design philosophies in concrete structures and design the beams under flexure and shear.

CO2: apply the codal provisions for the design of slabs.

CO3: employ the codal provisions for the design of reinforced concrete columns.

CO4: iIdentify the suitable type of footing for RC structures and design as per standards.

CO5: design and construct an appropriate staircase for buildings.

Board of Studies (BoS) :
16th BoS of CE held on 5.1.2022

Academic Council:
18th Academic Council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	H	L	H	L	H				L	L			M	H	
CO2	H	L	H	L	H				L	L			M	H	
CO3	H	L	H	L	H				L	L			M	H	
CO4	H	L	H	L	H				L	L			M	H	
CO5	H	L	H	L	H				L	L			M	H	

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

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

SDG - 11 : Make cities and human settlements inclusive, safe, resilient and

sustainable

Statement: Efficient reinforced concrete design is a prerequisite of safe, resilient and sustainable building construction.

CED 2204	ESTIMATION AND COSTING OF	L	T	P	C
SDG: 8	INFRASTRUCTURE PROJECTS	2	0	2	3

COURSE OBJECTIVES:

COB1: To understand the basic concepts of planning and estimation of buildings.

COB2: To impart knowledge on various methods of detailed estimation of buildings.

COB3: To introduce the concepts of specification writing and rate analysis and tendering process.

COB4: To enable knowledge on quoting tenders and contracts.

COB5: To provide understanding on valuation engineering and report preparation.

MODULE I   INTRODUCTION   4 + 4

Estimation- Necessity of Estimation - Duties and requirements of a good Quantity Surveyor- Types of Estimates- Approximate and Detailed Estimates - Taking off Quantities - Units of measurements – Measurement Books – Consideration for Deductions of openings – Painting co-efficients - Task/Out-turn work – Standard Data Book - Schedule of rates - Revision of rates - Market Rates- Lead and Lift - Cost of conveyance and handling charges – Lump sum and Contingencies - Planning and layout of residential building – size of rooms, floor area, height and thickness of walls.

MODULE II   DETAILED ESTIMATE   7 + 8

Load Bearing and Framed Structures - Calculation of quantities of earthwork, brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing – Long Wall and Short Wall method – Centre line method– Problems – Tutorial in Excel work sheet.

MODULE III   SPECIFICATIONS AND ANALYSIS OF RATES   7 + 6

Specifications - Detailed and General specifications - Standard specification – Advantages of Standard specifications - Writing standard specifications with reference to Tamilnadu Building Practice / Indian Standards / NBC - Examples - Analysis of rates – Earthwork -Brickwork – P.C.C and R.C.C – Plastering – Painting - Flooring.

MODULE IV   TENDERS AND CONTRACTS   5 + 6

Tenders – Tender procedures and drafting - Tamilnadu Tender Transparency Act – e-tendering – Encryption and Decryption – Contracts – Types of contracts – Construction contract documents.

**MODULE V   VALUATION AND TECHNICAL REPORT   7 + 6
                      WRITING**

Value and Cost- Purpose of valuation – Basic terms in valuation - Factors affecting the value of a property –Mortgage and Lease -Problems on determination of Sinking Fund - Problems on calculation of Depreciation - Methods of valuation of Buildings – Technical report writing – Necessity - Points to be considered – Documents to be enclosed – Report writing for construction of residential building, roadwork's and water treatment plants.

L – 30 ; P- 30 ; Total Hours – 60

TEXT BOOKS:
1. Chakraborti.M., "Estimating, Costing, Specification & Valuation in Civil Engineering", Chakraborti Publishers, 24th Edition, 2010.
2. Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt Ltd; 28th Revised Edition, New Delhi, 2020.

REFERENCES:
1. Kohli, D.D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S Chand Publishers, 13th edition, New Delhi, 2013.
2. Rangwala, "Estimating, Costing and Valuation", Rangwala Publishers, 17th edition, 2017.

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: plan and estimate different items of work for buildings.
CO2:estimate the quantities of items of works involved in construction of residential and commercial building in detail
CO3:prepare specification report and analyse the rate involved for each item of works to be done.
CO4:quote tenders and contract agreements in construction field.
CO5:determine the value of a building and also excel in technical report writing

Board of Studies (BoS) :   **Academic Council:**
16th BoS of CIVIL held on 05.01.2022   18th Academic Council held on
                                                24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	M	H			L			M		L	M		L	H	
CO2	H	H			M			M	M	H	M	M	L	H	
CO3	M	M	L		M		L	M	L	M	L	M	L	H	
CO4	M		L		L		L	M	M	L	L	M		H	
CO5	L		L		L		L	L	M	L	M	L		H	

Note: L- Low Correlation   M - Medium Correlation   H -High Correlation

SDG 8 : Promote sustained, inclusive and sustainable economic growth.

Statement : The holistic approach of estimating a building with in-depth description of the expenditures needed paves the way to prevent project cost overruns and promotes economic growth of the nation.

CED 2205   **WATER RESOURCES ENGINEERING**   L   T   P   C

SDG: 9   3   0   0   3

COURSE OBJECTIVES:

COB1: To provide the basic knowledge on crop water requirements and soil moisture irrigation relationship.

COB2: To develop idea on various irrigation methods and minimizing water losses.

COB3: To expose the students on various canals and tank irrigation systems.

COB4: To equip knowledge related to the impounding structures.

COB5: To familiarize with the concept of diversion structures and irrigation management
.

MODULE I   INTRODUCTION   9

Irrigation - Need, merits and demerits of irrigation – Crop and crop seasons in India - Duty – Duty Delta relationship – Factors affecting duty - Irrigation efficiencies - Consumptive use of water –Soil moisture irrigation relationship – Field capacity - Determination of depth and frequency of irrigation - Irrigation schemes - Planning and Development of irrigation projects.

MODULE II   IRRIGATION METHODS   8

Types of irrigation – Surface and Sub surface irrigation – Techniques for water distribution - Flooding Methods - Canal irrigation – Lift irrigation – Tank irrigation – Sprinkler irrigation – Drip irrigation – Need for optimization of water use - Minimizing irrigation water losses.

MODULE III   WATER CONVEYANCE AND STORAGE STRUCTURES   9

Canal - Classification of canals - Alignment of canals – Canal lining – Types of lining - Unlined canal - Kennedy's and Lacey's Regime theory - Canal drops – Types and functions - Tank - Isolated tanks – Tanks in series – Embankments - Tank Outlets/Tank Sluices - Surplus weir.

MODULE IV   IMPOUNDING STRUCTURES   10

Weirs –Types and functions - Elementary profile of a weir – Weirs on pervious foundations – Seepage analysis -Bligh's and Khosla Theories – Dams – Site selection - Factors affecting location and type of dams - Gravity dams – Earth dams – Arch dams – Forces on gravity dams - Spillways – Types and functions.

MODULE V DIVERSION STRUCTURES AND WATER RESOURCE 9
MANAGEMENT

Cross drainage works –Types and functions – Diversion head works – Canal regulators – Cross and Head Regulators – River Training works - On farm development works - Percolation Pond - Check dams - Participatory irrigation management – Water users associations – Changing paradigms in water management – Performance evaluation.

L – 45; Total Hours – 45

TEXT BOOKS:
1. Asawa, G.L., "Irrigation and Water Resources Engineering," New age International publishers, 2005.
2. Raghunath H.M., "Irrigation Engineering", Wiley India Pvt Ltd Publication, 2012.
3. Santosh Kumar Garg., "Irrigation Engineering and Hydraulic Structures" Khanna Publishers, New Delhi, 2013.

REFERENCES:
1. Darde P.N., "Irrigation Engineering", Vayu Education of India, 2nd Edition, 2020.
2. Dilip Kumar Majumdar, "Irrigation Water Management (Principles & Practices)", Prentice Hall of India (P) Ltd., New Delhi, 2004.
3. Novak, P, Moffat, A.I.B, Nalluri, C and Narayanan, R, "Hydraulic Structures", CRC press, 4th Edition, 2006.

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

CO1: estimate crop water requirements, irrigation efficiency and the consumptive use of water for irrigation.

CO2: assess knowledge on different methods of irrigation and optimum method of irrigation for judicious use of water resources.

CO3: develop a wide knowledge on the canal and tank irrigation system

CO4: identify the major concept of structures like dams, spillways, weirs and barrage structures.

CO5: determine the knowledge about the functions of diversion structures and water management.

Board of Studies (BoS) :	**Academic Council:**
16th BOS of Civil held on 5.1.2022	18th Academic Council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	-	L	L	-	-	L	-	-	-	-	-	M	M	-	-
CO2	-	-	L	L	-	L	M	L	-	-	L	L	M	-	-
CO3	H	H	L	-	-	L	-	-	-	-	-	-	M	-	-
CO4	H	H	L	-	L	L	-	-	-	-	-	M	M	-	-
CO5	H	H	L	-	-	L	L	L	H	-	H	L	M	-	-

Note: L- Low Correlation   M - Medium Correlation   H - High Correlation

 SDG 9: Investments in infrastructure are crucial to achieving sustainable development.

The structures like diversion head works, canal regulators etc are constructed for the sustainable use of water.

CED 2206

SDG: 11

SURVEY AND SOIL INVESTIGATION CAMP

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

The objectives of the course are to impart knowledge on

COB1: the methods of preparing contour maps from the elevation data.

COB2: longitudinal sectioning profiles &cross-sectional profiles for a new road, drainage route to compute the volumes of embankment and excavation.

COB3: the concept of triangulation surveying using a total station.

COB4: the characteristics of a highway curve and also sketch & set out the excavation markings of a residential building.

COB5: the execution of real-time soil investigations.

PRACTICALS

List of Experiments:

1. Preparation of elevation & contour map.
2. Preparation of longitudinal sectioning profiles &cross-sectional profiles for a new road, drainage route.
3. Computation of reduced level (RL) of points using profile leveling.
4. Determination of area of survey tract using triangulation surveying.
5. Determination of the location of a point using GPS.
6. Determination of the shortest distance between two points and its gradient by tachometric traversing.
7. Setting out of a Curve for a new road or rail alignment.
8. Marking of foundation for a multi-storey building.
9. Soil Investigation - Conduction of Standard Penetration Test.
10. Soil Investigation - Preparation of bore log & soil profile.

P – 30; Total Hours – 30

TEXTBOOKS:

1. Arora.K.R., "Surveying", Vol. I & II, 15th Edition, Standard Book House, New Delhi, 2018.
2. Kanetkar.T.P., "Surveying and Levelling", Vol. I and II, Standard Publication, 2008.
3. Punmia. B.C., Ashok Kumar Jain and Arun Kumar Jain, "Surveying", Vol. I, II and III, 15th Edition, Laxmi Publications, New Delhi, 2015.

REFERENCES:

1. Clark. D., "Plane and Geodetic Surveying", Vol. I and II, 6th edition, C.B.S.

Publishers and Distributors, New Delhi, 2017.

2. Heribert Kahmen and Wolfgang Faig, "Surveying", Walter de Gruyter, 2012.

3. James M. Anderson and Edward M. Mikhail, "Introduction to Surveying", 7th Edition, McGraw Hill, 2015.
4. https://civilengineeringnotes.com/surveying/

COURSE OUTCOMES:

After completion of the course, the students will be able to

CO1: plan and execute a survey for topography modeling of terrain and create a contour map.

CO2: plan and execute the survey for the formation of a new road alignment by longitudinal sectioning and cross-sectioning profiles and compute the volumes of embankment and excavation.

CO3: determine the area of a tract of land using triangulation surveying and determine the location of points using GPS.

CO4: compute the characteristics of a highway curve and set out the same by an appropriate method and also sketch out the excavation markings of a residential building and set out the same.

CO5: execute a soil investigation programmed, sketch the soil profile and compute the safe bearing capacity of the soil.

Board of Studies (BoS) :
16th BoS of CIVIL held on 05.01.2022

Academic Council:
18th Academic Council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	H	H	M	L	H	L	L	-	L	L	-	-	L	M	-
CO2	H	H	H	L	L	L	L	-	L	L	-	-	L	M	-
CO3	H	H	M	L	H	L	L	-	L	L	-	-	L	M	-
CO4	H	H	M	L	H	L	L	-	L	L	-	-	L	M	-
CO5	H	M	M	L	H	L	L	-	L	L	-	-	L	M	-

Note: L- Low Correlation   M -Medium Correlation   H -High Correlation

SDG 11: Make cities inclusive, safe, resilient and sustainable.

The gained knowledge results in measuring and mapping the city to create a digital simulation that allows for forecast any event and helps in better decision making for resilient structures.

GED 2201	WORKPLACE SKILLS AND APTITUDE	L	T	P	C
SDG: 8	FOR ENGINEERS	0	0	2	1

COURSE OBJECTIVES:

COB1: To expose them to reading for specific purposes, especially in professional contexts

COB2: To expose them to the process of different kinds of formal writing

COB3: To prepare the students to be successful in their career

COB4: To familiarize various problem-solving techniques in aptitude and puzzles.

MODULE I   EXTENSIVE READING & WRITING   07

Reading for comprehension - inferring and note-making – Process of writing-paragraph development - elements of business writing: Email, memos.

MODULE II   INTENSIVE READING & WRITING   08

Intensive reading and reviewing - Interpretation of charts, graphs - Résumé - Letter of enquiry, thanksgiving letters.

MODULE III   QUANTITATIVE APTITUDE   08

Percentage - Ratio and Proportion - Profit and Loss – Averages, Allegations and Mixtures.

MODULE IV   LOGICAL COMPETENCY   07

Syllogism – Blood Relations- Number, Alpha and Alpha numeric series - Puzzles – Cubes and Dice - Odd One Out-Coding and Decoding

L – 30; Total Hours- 30

REFERENCES:

1. Sharma, R.C. and Mohan, Krishna (2010). Business Correspondence and Report Writing. 4th edition. Tata McGraw Hill Education Private Limited, New Delhi
2. Whitby, Norman (2014). Business Benchmark: Pre-Intermediate to Intermediate. Cambridge University Press, UK
3. Tyra .M, Magical Book On Quicker Maths, BSC Publishing Company Pvt. Limited, 2009
4. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Limited, 2017

5. R. S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning , S. Chand Limited, 2010

6. Khattar Dinesh , The Pearson Guide to Quantitative Aptitude for Competitive Examinations, 3e, Pearson India , 2016

7. Rajesh Verma , Fast Track Objective Arithmetic Paperback , Arihant Publications (India) Limited , 2018

8. Arun Sharma Teach Yourself Quantitative Aptitude Useful for All Competitive Examinations, McGraw Hill Education (India) Pvt. Limited, 2019.

COURSE OUTCOMES:

CO1: Demonstrate reading skills with reference to business related texts

CO2: Draft professional documents by using the three stages of writing

CO3: Apply various short cut techniques for solving complicated aptitude problems

CO4: To understand various problems and patterns of different ways to solve it

Board of Studies (BoS) :
13thBoS of the Department of English held on 17.6.2021

Academic Council:
17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1		L		H						H					
CO2			L							H					
CO3			L				M								
CO4		H		M											
CO5															

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

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

Statement:Demonstrating, Drafting and applying various techniques for sustainable growth to employment.

GED 2202
SDG: 16

INDIAN CONSTITUTION AND HUMAN RIGHTS

L	T	P	C
2	0	0	0

COURSE OBJECTIVES:

COB1: To explicate the emergence and evolution of Indian Constitution.

COB2: To have an insight into the philosophy of fundamental rights and duties, and Directive Principles.

COB3: To differentiate the structure of executive, legislature and judiciary.

COB4: To understand human rights and its implication - local and international and redressal mechanism.

MODULE I	INTRODUCTION AND BASIC INFORMATION ABOUT INDIAN CONSTITUTION	8

Meaning of the constitution law and constitutionalism - Historical Background of the Constituent Assembly - Government of India Act of 1935 and Indian Independence Act of 1947 - The Constituent Assembly of India - Enforcement of the Constitution - Indian Constitution and its Salient Features - The Preamble of the Constitution. Citizenship.

MODULE II	FUNDAMENTAL RIGHTS, DUTIES AND DIRECTIVE PRINCIPLES	7

Fundamental Rights and its Restriction and limitations in different complex situations - Directive Principles of State Policy (DPSP) & its present relevance in our society with examples- Fundamental Duties and its Scope and significance in nation building - Right to Information Act 2005.

MODULE III	GOVERNANCE IN INDIA	8

The Union Executive – the President and the Vice-President – The Council of Ministers and the Prime Minister – Powers and functions. The Union legislature – The Parliament – The Lok Sabha and the Rajya Sabha, Composition, powers and functions – Government of the State - The Governor – the Council of Ministers and the Chief Minister – Powers and Functions-Elections-Electoral Process and Election Commission of India - Indian judicial system.

MODULE IV	HUMAN RIGHTS AND INDIAN CONSTITUTION	7

Human rights – meaning and significance - Covenant on civil and political rights - Covenant on Economic, Social and Cultural rights - UN mechanism and agencies - The Protection of Human Rights Act, 1993 – watch on human

rights and enforcement - Roles of National Human Rights Commission of India - Special Constitutional Provisions for SC & ST, OBC - Special Provision for Women, Children & Backward Classes.

L – 30; Total Hours– 30

TEXT BOOKS:

1. B.K. Sharma, Introduction to the Constitution of India, 6th ed., PHI Learning Private Limited, New Delhi 2011
2. Durga Das Basu "Introduction to the Constitution on India", (Students Edition.) Prentice –Hall EEE, 19th / 20th Edn. 2008
3. M.P. Jain, Indian Constitutional Law, 7th ed., LexisNexis, Gurgaon. 2014.

REFERENCES:

1. Fadia B.L "Indian Government and Politics", Sahitya Bhavan Publications. 2010
2. Kashyap Subhash C "Our Constitution: An Introduction to India's Constitution and constitutional Law, NBT. 2017
3. M.V.Pylee "An Introduction to Constitution of India", Vikas Publishing. 2002
4. Sharma Brij Kishore "Introduction to the Indian Constitution", 8th Edition, PHI Learning Pvt. Ltd. 2015
5. Latest Publications of NHRC - Indian Institute of Human Rights, New Delhi.

COURSE OUTCOMES:

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

CO1: describe the emergence and evolution of Indian Constitution.

CO2: realize the status and importance of fundamental rights, fundamental duties and directive principles of state policy and relation among them by understanding the articulation of its basic values under the Constitution of India.

CO3: compare the various structure of Indian government.

CO4: recognize the human rights, cultural, social and political rights and its relationship with Indian constitution. .

Board of Studies (BoS) :
4thBoS of SSSH held on 28.06.2021

Academic Council:
17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1			M			H	M	L	M		M	
CO2			H			M	H	M			H	
CO3			M			H	M	L			L	
CO4			H			H	H	M	M			H

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

SDG 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Application of human, legal and political rights leading to empowerment in real-life situations for protection of fundamental freedoms and freedom from violence, abuse, trafficking and exploitation are at the core of human rights.

PROFESSIONAL ELECTIVES COURSES

CEDX 16   **ADVANCED CONCRETE TECHNOLOGY**   L   T   P   C

SDG: 11   3   0   0   3

COURSE OBJECTIVES: The objective of the course is to impart adequate knowledge on

      COB1: usage of mineral and chemical admixtures in concrete

      COB2: mechanism of corrosion of steel rebar in concrete and protection methods

      COB3: ready-mix concrete and self-compacting concrete

      COB4: Non-destructive testing techniques to assess distress in concrete

MODULE I   **MINERAL ADMIXTURES IN CONCRETE**   9

Supplementary cementitious materials : source, significance and overview. Flyash (different classes), silica fume, metakaoline, blast furnace slag, rice husk, titanium-di-oxide : properties – influence on fresh concrete, hardened concrete, microstructure and durability properties of concrete.

MODULE II   **CHEMICAL ADMIXTURES IN CONCRETE**   9

Chemical admixtures for concrete: overview and significance. Water reducers / plasticizers : types, working mechanism, optimum dosage, influence on workability and application areas. Viscosity modifying agents, retarders, set accelerators, air entraining agents, damp-proofers, water repelling admixtures, shrinkage reducing admixtures and corrosion inhibitors : types, brief working mechanism and application areas.

MODULE III   **CORROSION OF STEEL IN CONCRETE**   9

Mechanism of corrosion of steel in concrete – causes and influencing parameters –Carbonation, chloride attack, microbial induced corrosion and acid attack: deteriorating mechanism - consequences of corrosion in reinforced concrete and pre-stressed concrete structures - Corrosion protection methods: overview - Protective coating to steel rebars: fusion bonded epoxy coating, galvanization and cement polymer anticorrosive coating – sacrificial anode cathodic protection.

MODULE IV   **READY MIX CONCRETE AND SELF COMPACTING**   9
                    CONCRETE

Ready mix concrete: ingredients, mix proportion, mix design, manufacturing process and good construction practices. Self compacting concrete: ingredients, mix design

as per EFNARC guidelines, workability requirements of SCC : Abrams cone, J-ring, V-funnel, L-box and U-box, good construction practices and application areas.

MODULE V NON-DESTRUCTIVE TESTING TECHNIQUES   9

Non-Destructive techniques for assessing distress in concrete members: overview – Rebound hammer test, ultrasonic pulse velocity test, concrete resistivity, cover-meter, concrete core test, half-cell potential test, tests for carbonation and chloride content.

L – 45 ; TOTAL HOURS – 45

TEXT BOOKS:
1. Brooks, J.J. and Neville, A.M., "Concrete Technology", Pearson, 2019.
2. Santhakumar, A.R., "Concrete Technology" Oxford, 2006.

REFERENCES:
1. Kumar Mehta. P. and Paulo J.M. Monteiro., "Concrete : Microstructure, Properties, and Materials" 4th Edition, McGraw Hill Education (India) Pvt. Ltd., 2014.
2. Shetty.M.S., and A.K. Jain "Concrete Technology (Theory and Practice)", S. Chand and Company Ltd., 2010.
3. Gambhir.M.L., "Concrete Technology", 5th Edition, Tata McGraw Hill Education, 2017
4. Nayak, N.V, and Jain, A.K, Handbook on Advanced Concrete Technology, Narosa Publishing House Pvt. Ltd., New Delhi, 2012.
5. Zongjin Li, "Advanced Concrete Technology", John Wiley & Sons, 2011.
6. EFNARC (2002), "Specification and Guidelines for Self-compacting Concrete", Surrey, UK.
7. John Broomfield, "Corrosion of Steel in Concrete – Understanding, Investigation and Repair", CRC Press, London, 2003.
8. Malhotra, V.M. and Carino, N.J., "Handbook on Non-destructive Testing of Concrete", CRC Press, 2004.

COURSE OUTCOMES: At the end of the course, students will be able to
  CO1: understand the significance of addition of mineral admixtures in concrete for varied applications.
  CO2: suggest the chemical admixtures for real time applications
  CO3: describe the manufacturing of ready-mix concrete

  CO4: perform mix design of self-compacting concrete as per EFRAC standards
  CO5: describe mechanism of corrosion in concrete and suggest protection

measures

CO6: describe NDT techniques to assess distress in concrete structures

Board of Studies (BoS) :
16th BoS of Civil held on 05.01.2022

Academic Council:
18th AC held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1							M						H		
CO2							M						H		
CO3							M						M		
CO4							M				M		M		
CO5					H		M				M		H		
CO6					H					M	M		H		

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

SDG 11 : Make cities and human settlements inclusive, safe, resilient and sustainable

Designing of durable and sustainable concrete by using mineral admixtures, chemical admixtures in concrete, adopting corrosion protection methods during construction and monitoring well-being of structures using NDT techniques, make the human settlements safe and resilient and leads to sustainable development.

CEDX 31   **ENGINEERING GEOLOGY**   L   T   P   C

SDG: 11   3   0   0   3

COURSE OBJECTIVES:

The objectives of the course are to impart knowledge on

> **COB1:** various earth processes to consider them during the planning and execution of civil engineering projects.
>
> **COB2:** demarcation and differentiation of various rock types and minerals to be used as construction materials.
>
> **COB3:** the areas of weakness in a zone and to eradicate the weakness during civil engineering projects.
>
> **COB4:** the geological conditions of tunnels, dams and reservoirs.
>
> **COB5:** different remote sensing techniques in exploring the mineral and rock types.

MODULE I   **PHYSICAL GEOLOGY**   **8**

Branches of geology – Scope of engineering geology - Earth Internal structure – Seismological evidence, the final picture of the earth, Earth processes – Weathering – Types of weathering, Physical and chemical weathering, products of weathering, Volcanism – types of volcanoes, causes and effects, Earthquake – types of seismic waves, distribution and origin - Plate tectonics theory.

MODULE II   **MINERALOGY & PETROLOGY**   **9**

Introduction – Mineralogy, Physical properties of minerals – color, lustre, cleavage, structure, hardness, specific gravity, Rocks –Classification of rocks– Igneous, sedimentary and metamorphic rocks, Igneous rocks – types, the texture of igneous rocks, engineering properties, Sedimentary rocks – formation of clastic and non-clastic sedimentary rocks, classification of sedimentary rocks, Metamorphic rocks – types of metamorphism, engineering properties of rocks.

MODULE III   **STRUCTURAL GEOLOGY**   **10**

Types of geological structures - Folds, Faults and Joints, Folds – Parts of a fold, classification of folds, causes, engineering properties of folds, Faults – Basic terms, types of faults, recognition of faults, causes and engineering considerations of faults, Joints – occurrence, the origin of joints, causes and their effect on civil engineering projects.

MODULE IV   **GEOLOGY FOR CIVIL ENGINEERING**   **10**

Geological conditions necessary for the construction of tunnels, dams, reservoirs,

Tunnels – types of tunnels, geological investigations, soft ground tunneling, Dams - types of dams, geotechnical considerations, geological characters for investigation, forces acting on a dam, Reservoirs – Geological Investigations, silting of reservoirs, Geophysical investigations – electric method, seismic method, gravitational method, magnetic method.

MODULE V   MISCELLANEOUS APPLICATIONS   8

Landslides - Causes and effects, Coastal erosion and coastal prevention structures - Remote sensing applications in mineral exploration – case studies.

L – 45; Total Hours – 45

TEXTBOOKS:
1. ChennaKesavalu. N., "Textbook of Engineering Geology", Macmillian Publishers India Ltd, New Delhi, 2009.
2. Parbin Singh, "Engineering and General Geology", S.K. Kataria& Sons, Katson Publication House, 2013.
3. Rao. P.C. & Rao. D.B., "A Text Book of Geology", Discovery Publishing House, New Delhi, 2010.
4. Varghese. P.C., "Engineering Geology for Civil Engineers", PHI Learning Private Ltd, New Delhi, 2012.
5.

REFERENCES:
1. Lillesand.T.M. and Kiefer.R.W., "Remote sensing and image interpretation", John Wiley and sons, 7th Edition, 2015.
2. Sawant P.T., "Engineering & General Geology", New India Publishing Agency, 2011.
3. https://geologyscience.com/methods-of-geology/structural-geology/

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

CO1: identify the geological parameters required for the construction, planning and design of civil engineering structures.

CO2: demarcate and differentiate between rock types and minerals to be used as construction materials.

CO3: identify the areas of weakness in a zone, consider, and eradicate the weakness during the civil engineering projects.

CO4: select the necessary geological conditions of tunnels, dams and reservoirs.

CO5: employ remote sensing techniques in exploring the mineral and rock types.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	M	L	H	L	L	L	M	L	-	-	-	-	M	L	-
CO2	L	L	L	L	L	L	M	L	-	-	-	-	H	M	-
CO3	M	L	H	M	L	H	H	L	-	M	-	-	H	M	-
CO4	L	L	H	M	L	H	H	L	-	M	-	-	H	M	-
CO5	M	L	M	M	L	H	H	L	-	M	-	-	H	M	-

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

SDG 11: Make cities inclusive, safe, resilient and sustainable.

The integrated knowledge of mineral and rock properties under different geological conditions helps in designing an economical and safe foundation leading to the construction of resilient infrastructure.

CEDX 41   **AIR AND NOISE POLLUTION CONTROL**   L   T   P   C
SDG: 3   3   0   0   3

COURSE OBJECTIVES:

The objectives of the course are to impart knowledge on

COB1: the sources of air pollution and their effects on living and non-living environment.

COB2: sampling methods, analysis of air pollutants and dispersion of pollutants in environment

COB3: air pollution control equipment for gaseous and particulate pollutants

COB4: air quality management and regulations.

COB5: the sources, effects, prevention and control of noise pollution.

MODULE I   SOURCES AND EFFECTS OF AIR POLLUTANTS   8

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Natural contaminants – aerosol - gases and vapour - Elements of atmosphere – Meteorological factors - Effects of air pollution on human beings, materials, vegetation, animals – global warming - ozone layer depletion.

**MODULE II   SAMPLING, ANALYSIS AND DISPERSION OF   9
                        POLLUTANTS**

Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles – Wind roses – Lapse rate - Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models – Applications.

MODULE III   AIR POLLUTION CONTROL   9

Concepts of air pollution control – Principles and design of control measures – Particulates pollutant control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion – Pollution control for specific major industries.

MODULE IV   AIR QUALITY MANAGEMENT   9

Air quality standards – Air quality monitoring – Preventive measures - Air pollution control initiatives – Zoning – Town planning regulations for new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality.

MODULE V   NOISE POLLUTION   10

Sources of noise pollution – Characterization of Noise based on sources - Effects – Assessment - Standards – Prevention and Control of Noise Pollution at source, transmission, and receptor protection and other types - Noise Sound Absorbent – Noise

Pollution Analyser –   Acoustic quieting - Mechanical isolation technique, Acoustical absorption, Constrained layer damping – OSHA Noise standards and indices.

L – 45; Total Hours – 45

TEXT BOOKS:

1. Anjaneyulu, D., "Air Pollution and Control Technologies", Allied Publishers, Mumbai, 2002.
2. Chandrappa, R., Kulshrestha, U.K., "Sustainable Air Pollution Management: Theory and Practice", Springer International Publishing House, AG Switzerland, 2015.
3. Rao, C.S., "Environmental Pollution Control Engineering", New age International (P) Ltd., Revised 2nd Edition, 2006.
4. Surampalli, R., Zhang,T.C., Brar, S.K., Hegde,K., Pulicharla, R., Verma, M., "Handbook of Environmental Engineering", McGraw Hill Professional, 2018.

REFERENCES:

1. Antony Milne, "Noise Pollution: Impact and Counter Measures", David & Charles PLC, 2009.
2. Noel de Nevers, "Air Pollution control Engg." McGraw-Hill, New York,2005.
3. Peterson and Gross .E Jr., "Hand Book of Noise Measurement", 7th Edn, 2003.
4. Rao.M.N , Rao, H.V.N "Air Pollution", Tata McGraw Hill, 2009.
5. Vallero, D., "Fundamentals of Air Pollution", Elsevier Publishers, 5th Edition, 2014.
6. Wang, L.K., Pereira,N.C., "Hung,Y.T., "Advanced Air and Noise Pollution Control" Hand book of Engineering", Vol-II, The Humana Press, Springer Science & Business Media New Jersey, 2007.

COURSE OUTCOMES:

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

CO1: classify the sources of air pollution and list its effects on living and non-living environment

CO2: sample, analyse the various air pollutants and demonstrate the procedure for dispersion.

CO3: identify and describe the functions of equipment available to control air pollution

CO4: suggest air pollution management through legislation and regulations

CO5: describe sources, characteristics, effects and control of noise pollution.

Board of Studies (BoS) :
16th BoS of Civil held on 5.1.2022.

Academic Council:
18th Academic Council held on 24.02.2022

	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	PSO 3
CO1	-	-	L	-	-	M	M	-	-	-	-	L	-	-	L
CO2	-	-	L	-	-	M	M	M	L	L	-	L	L	-	L
CO3	-	-	L	-	-	M	M	M	L	L	-	L	L	-	L
CO4	-	-	L	-	-	M	M	M	L	L	-	L	-	-	L
CO5	-	-	L	-	-	M	M	M	L	L	-	L	L	-	L

Note: L- Low Correlation   M -Medium Correlation   H -High Correlation

SDG 3 : Ensure healthy lives and promote well-being for all at all ages.

Statement : The understanding of air & noise pollution control and management substantially reduce the pollution and improves the health and well being of human

CEDX 42	**SOLID WASTE MANAGEMENT**	L	T	P	C
SDG: 3 & 7		3	0	0	3

COURSE OBJECTIVES:

The objectives of the course are to impart knowledge on

COB1: sources, types, characteristics and effects of improper disposal of municipal solid waste.

COB2: on-site waste segregation and storage methods

COB3: different methods employed for waste collection and transfer

COB4: various types of waste processing techniques and resource recovery

COB5: solid waste management rules and components of a land fill.

MODULE I   INTRODUCTION TO MUNICIPAL SOLID WASTES   9

Sources and types of solid wastes – Quantity – Factors affecting generation of solid wastes - Characteristics – Methods of sampling and characterization - Effects of improper disposal of solid wastes – Public health effects - Principle of solid waste management – Social & Economic aspects - Public awareness - Role of NGOs.

MODULE II   ON-SITE STORAGE & HANDLING   9

Storage of household waste - Dry, wet and domestic hazardous, On-site storage methods - Materials used for containers – On-site segregation of solid wastes – Public health & Economic aspects of storage – Options under Indian conditions – Critical Evaluation.

MODULE III   COLLECTION AND TRANSFER   9

Methods of Collection – Primary and secondary collection - Types of vehicles –Light commercial vehicles, Four wheeled mini trucks, Skip truck - Manpower requirement – Collection routes - Transfer stations – Selection of location, operation & maintenance - Extended producer responsibility.

MODULE IV   OFF-SITE PROCESSING   9

Processing techniques – Mechanical volume reduction, Thermal volume reduction and Chemical volume reduction – Equipment - Compactors, Hydro-pulper, Hammer Mill, Shredder, Magnetic Seperators ; Resource recovery from solid wastes – composting, incineration, Pyrolysis, Emerging trends in gasification.

MODULE V   DISPOSAL OF SOLID WASTE   9

Solid Waste management Rules 2016- Salient features- Duties and responsibilities of various authorities - Dumping of solid waste; Sanitary landfills – site selection, design and operation of sanitary landfills – Leachate collection & treatment – Emerging

challenges in solid waste management.

L – 45; Total Hours – 45

TEXT BOOKS:
1. George Tchobanoglous, Hilary Theisen, Vigil, S. A. Integrated Solid Waste Management, Engineering Principles and Management Issues, McGraw-Hill Education (India) Private Limited, 2014.
2. Ramesha Chandrappa, Diganta Bhusan Das, Solid Waste Management Principles and Practice, Springer Berlin Heidelberg, London, 2012
3. Ramachandra, T. V. Management of Municipal Solid Waste, TERI Press, New Delhi, 2011
4. Sasikumar, K., Sanoop Gopi Krishna, Solid Waste Management, PHI Learning, New Delhi, 2009.

REFERENCES:
1. CPHEEO, "Manual on Municipal Solid Waste Management", Central Public Health and Environmental Engineering Organisation, New Delhi, 2016.
2. Gomes, Maria Isabel, Martinho, G., Pires, A., Rodrigues, S., "Sustainable Solid Waste Collection and Management", Springer International Publishing, Germany, 2018.
3. MSW Management Rules 2016, Govt. of India https://cpcb.nic.in/rules-2/

COURSE OUTCOMES:
At the end of the course the student will be able to
CO1: describe the different sources, types and the effects of improper disposal of municipal solid waste
CO2: describe the storage, segregation and handling of solid waste
CO3: explain the methods of collection of solid waste
CO4: identify the offsite processing techniques and resource recovery from solid waste
CO5: explain the SWM rules and detail the operation of a land fill.

Board of Studies (BoS) :
16th BoS of Civil held on 5.1.2022.

Academic Council:
18th Academic Council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	-	-	L	-	-	L	L		-	-	-	-	-	-	L
CO2	-	-	L	-	-	L	L		-	-	-	-	-	-	L
CO3	-	-	L	-	-	L	L		-	-	-	-	-	-	L
CO4	-	-	L	-	-	L	L		-	-	-	-	-	-	L
CO5			L			L	L								L

Note: L- Low Correlation   M - Medium Correlation   H -High Correlation

SDG 3: Ensure healthy lives and promote well-being for all at all ages

SDG 7: Affordable & Clean Energy

The knowledge about the management of solid waste and implementing techniques to minimize their adverse impacts on human health and environment   will ensure the promotion of a healthy community

CEDX 56   **WATER DISTRIBUTION SYSTEMS**   L   T   P   C

SDG: 6   3   0   0   3

COURSE OBJECTIVES:

COB1: To educate the students with basic concepts of water distribution system

COB2: To emphasis on the analysis of water distribution network.

COB3: To familiarize on the storm water runoff estimation and buried pipes.

COB4: To assess the design concepts of water distribution system.

COB5: To gain knowledge on the basic concepts of fluid transients

MODULE I   WATER SUPPLY SYSTEMS   9

Water requirement – Sources of water – Water demand – Reservoir storage – Nodal hydraulic gradient level values - Water supply consideration, Types of water supply systems- Piping system- Distribution network –Labeling- Network components – Network models – Design – Optimization in practice.

**MODULE II   HYDRAULIC   PRINCIPLES   AND   NETWORK   10
                         PARAMETERS**

Energy and hydraulic gradient lines – Head loss in links – Equivalent pipes – series – Parallel pipes – Path head loss and loop head loss – Analysis of water distribution network- Static node and Dynamic node – Network performance – flow analysis - Layout – in situ lining - Pipes material – Appurtenances – Minimization of water losses – Leak detection.

MODULE III   STORM WATER DISTRIBUTION AND BURIED PIPES   9

Planning – Runoff estimation – Rainfall data analysis – Storm water drains design Introduction to Buried pipes – External loads – Gravity flow design, Pressurized flow- Rigid and Flexible pipes – Installation – Trenchless technology.

MODULE IV   RELIABILITY ASSESSMENT AND DESIGN   8

Uncertainty and Reliability – Affecting events- Assessment – Reliability parameters – Configurations - Design methodology - Strengthening and Expansion.

MODULE V   FLUID TRANSIENTS   9

Basic equations of unsteady flows through closed conduits – methods – characteristics - Transients caused by centrifugal pumps and hydroelectric power plants.

L – 45; Total Hours – 45

TEXT BOOKS:

1. Bajwa. G. S, Practical handbook on Public Health Engineering, Deep

publishers, Shimla 2003.

2. Bhave P. R, Optimal design of water distribution networks, Narosa publishing House, New Delhi, 2003.

3. Wurbs R.A., and James W.P. Water Resources Engineering. Prentice Hall of India, Eastern Economic Edition. ISBN: 81-203-2151-0, New Delhi, 2007.

REFERENCES:

1. Larry.W. Mays., "Water Distribution System Handbook",2021.

2. Manual on storm water drainage system, CPHEEO, Ministry of Urban Development, GOI, New Delhi, 2019.

3. Manual on water supply and treatment, CPHEEO, Ministry of Urban Development, GOI, New Delhi, 1999.

4. Moser A. P, Buried pipe Design, 3rdEdition, American Water Works Association, 2008.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: define the water supply and demand and water distribution network creation for the effective water supply system.

CO2: assess the knowledge of hydraulics in the field of pipe line system and analyze the branch and loop network flow

CO3: explain storm water drain buried pipeline system. Design the underground storm water drainage system with hydraulic appurtenances

CO4: analyze the reliability of the water supply distribution system and prepare the detailed methodology for risk management and strengthening the system.

CO5: apply and design the unsteady flow pipe line network in order to with stand the surge/transient developed due to power failure of centrifugal pump and also due to hydroelectric power plant.

Board of Studies (BoS) :   **Academic Council:**

16th BOS of Civil held on 5.1.2022   18th Academic Council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO 3
CO1	H	M	-	-	-	M	-	-	-	-	-	H	H	M	L
CO2	H	H	H	-	M	M	M	-	L	-	M	H	H	H	M
CO3	H	H	H	-	H	M	M	-	L	-	M	H	H	H	M
CO4	M	M	-	-	H	M	M	-	L	-	M	H	H	M	L
CO5	M	-	-	-	-	-	-	-	-	-	-	H	H	M	L

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

SDG 6: Clean and accessible water for all which is an essential part of the world we want to live in.

Proper installation of pipelines for water distribution will be useful for the sustainable development of domestic and irrigation purposes.

CEDX 71　　　　　　**GPS AND DRONE SURVEYING**　　L　T　P　C

SDG: 11　　　　　　　　　　　　　　　　　　　　　3　0　0　3

COURSE OBJECTIVES:

The objectives of the course are to impart knowledge on

COB1: the determination of the precision of the GPS measurements and the working of GPS.

COB2: applying the measuring principle of GPS and Drones in civil engineering projects.

COB3: classifying the differences between relative and autonomous GPS positioning, code phase, carrier phase, DGPS and RTK.

COB4: the components of drones in surveying and mapping.

COB5: the various applications of GPS and Drone Surveying.

MODULE I　　　　GLOBAL POSITIONING SYSTEM　　　　　　8

History of GPS, GPS design objectives and details of segments space, control and user, blocks of GPS- Block I, II/IIA, IIR Satellites and IIF. GPS Signal Structure - Carriers, GPS codes: C/A, P, navigational message and GPS receiver: Types and Structure of receivers, Principles of GPS position fixing: Pseudo ranging, Determination of GPS satellite coordinates, Types of ephemerides, GPS errors.

MODULE II　　　GPS　　SURVEY　　METHODS　　AND　　10
**　　　　　　　　　APPLICATIONS**

Single Point or Point Vs Relative, Static Vs Kinematic, Real-time Vs Post mission, Practical GPS survey field procedures: Code and Carrier-based positioning, Accuracy and recording time, GPS Applications - Geodetic control surveys, Cadastral surveys, Engineering and monitoring, Military applications, Vehicle tracking and car navigation.

MODULE III　　　DIFFERENTIAL　　GLOBAL　　NAVIGATION　　9
**　　　　　　　　　SATELLITE SYSTEM (DGNSS)**

Introduction to GLONASS, Real-Time Kinematic (RTK) - Satellite Based Augmentation System (SBAS) - GNSS Errors -　GNSS Correction Methods - Global Navigation Satellite Systems (GNSS) Applications - Current trends and future.

MODULE IV　　　DRONE SURVEYING　　　　　　　　　　9

Introduction to drone surveying – Components of drone – Autonomous UAVs –

Architecture of an Autonomous system – Path planning – Innovative technological UAVs/Drones – UAV Communication Systems – UAV Data Collection – Data Processing Approaches – Regulatory systems for UAVs – SWOT Analysis of UAV Technology.

**MODULE V   APPLICATIONS OF GPS AND DRONE   9
                    SURVEYING**

Applications in Civil Engineering- mining process- Public infrastructure – resources management - disaster & rescue service - oil & gas monitoring, Forestry, Agriculture - goods delivery- crowd management, traffic regulation - urban planning - infrastructure monitoring, 3D mapping, surveillance, search & rescue - businesses.

L – 45; Total Hours – 45

TEXTBOOKS:
1. Awange, J. L., "Environmental Monitoring using GNSS: Global Navigation Satellite Systems", Springer, London, 2012.
2. Bhatta, B., "Global Navigation Satellite Systems: Insights into GPS, Glonass, Galileo, Compass, and Others", BS Publications, New Delhi, 2010.
3. Grewal, M. S., Weill, L. R., Andrews, A. P., "Global Positioning Systems, Inertial Navigation, and Integration", John Wiley & Sons, New York, 2006.
4. P.K.Garg, "Introduction to Unmanned Aerial Vehicles", New Age International Private Limited, New Delhi, 2020.

REFERENCES:
1. Hofmann-Wellenhof, B., Lichtenegger, H. and Collins, J., "Global Positioning System: Theory and Practice", Springer, Berlin, 2001.
2. Xu Guochang, "GPS: Theory, Algorithms and Applications", Springer, Berlin, 2007.
3. https://geodesy.noaa.gov/PUBS_LIB/Geodesy4Layman/TR80003D.HTM

COURSE OUTCOMES:
After completion of the course, the students will be able to
CO1: determine the position of the points with GPS measurements.
CO2: use different GPS survey methods to improve the positional accuracy
CO3: categorize the differences between relative and autonomous GPS positioning, code phase, carrier phase, DGPS and RTK.
CO4: apply the important concepts and components of drones in surveying and

mapping.

CO5: explore the various applications of GPS and Drone Surveying.

Board of Studies (BoS) :   **Academic Council:**

16th BoS of CIVIL held on 05.01.2022   17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	H	L	L	H	L	L	-	L	L	-	-	L	M	-
CO2	H	H	M	M	H	L	L	-	L	L	-	-	L	M	-
CO3	H	H	M	M	H	L	L	-	L	L	-	-	L	M	-
CO4	H	H	M	M	H	L	L	-	L	L	-	-	L	M	-
CO5	H	H	M	M	H	L	L	-	L	L	-	-	L	M	-

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

SDG 11:Make cities inclusive, safe, resilient and sustainable.

Statement:

The gained knowledge leads to map the cities to enable better planning and to provide living space to all creating inclusive growth and better utilization of resources to enhance sustainability.

CEDX 74   **PRINCIPLES OF ARCHITECTURE**   L   T   P   C

SDG: 4   3   0   0   3

COURSE OBJECTIVES:

COB1: To understand the elements of design

COB2: To gain knowledge of various principles of organization from nature.

COB3: To explore the ideologies of design communication and graphics

COB4: To gain knowledge of various architect in the contemporary architecture

COB5: To understand the landscaping of functional areas

MODULE I   ELEMENTS OF DESIGN IN NATURE   9

Points, lines and shapes found in nature. Role of elements to emphasize the location, as landmark, for direction and dominance, etc. Patterns in nature and building design. Chaos and Order. Study: examples of nature inspired man made design.

MODULE II   PRINCIPLES OF ORGANIZATION FROM NATURE   9

Fractals — patterns, proportion, repetition, harmony- Axis, Symmetry/Asymmetry, Massing, Form generating exercises to approach site planning in small scale and large scale projects.

MODULE III   DESIGN COMMUNICATION AND GRAPHICS   9

Importance of graphics in architectural design. Study of site plans, city plans, conceptual Drawings. Interpretation of architects, Space planning standards and principles conceptual sketches and the respective buildings.

MODULE IV   RECENT TRENDS   9

Contemporary Architecture- contribution of master builders like Lecorbusier, Frank Loyed wright, Vanderrohe, Buckminster fuller, Larry Bakker.

MODULE V   LANDSCAPING OF FUNCTIONAL AREAS   9

Urban open spaces and principle of urban landscape; Street landscaping, landscape design for waterfront areas and functional areas in urban centers. Green infrastructure including green roofs and walls.

L - 45; Total Hours – 45

TEXT BOOKS:

1. Francis D.K. Ching, Architecture-Form, Space and Order, Van Nostrand, Wiley Publisher , 4th edition 2014
2. Goldsmith.S "the responsive city: engaging communities through data – smart

governance" John Wiley & sons, 2014

3. Simon Unwin, Analysing Architecture, Routledge, London, 2003.

REFERENCES:

1. Leland M. Roth - Understanding Architecture, its experience history and Steen Eiler Rasmussen - Experiencing architecture, MIT Press, 2004.
2. Peter von Meiss -Elements of architecture - from form to place, Spon Press 2012.
3. Yogeswari. K, Principles of Architecture, Ramalinga Publishers 2005

COURSE OUTCOMES:

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

CO1: describe elements of design in nature

CO2: apply the principles of architecture and applications of the same in buildings and spaces

CO3: explain the character and style of buildings with examples using design communications and graphics

CO4: describe the role of various architect in the contemporary architecture

CO5: ascertain the role of landscape design in the shaping of outdoor environments.

Board of Studies (BoS) :
16thBoS of Civil held on
05.01.2022

Academic Council:
18th Academic Council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	M	M	L	L	L	L	M	L	L	M	L	L	L	L	L
CO2	M	M	L	L	L	L	M	L	L	M	L	L	L	L	L
CO3	M	M	L	L	L	L	M	L	L	M	L	L	L	L	L
CO4	M	M	L	L	L	L	M	L	L	M	L	L	L	L	L

Note: L- Low Correlation   M -Medium Correlation   H -High Correlation

SDG 4 : Quality Education

Statement : The Principles and elements of architecture will enhance the quality of knowledge in construction of aesthetical buildings.

CEDX 76	VASTHU SASTRA AND ARCHITECTURAL	L	T	P	C
SDG: 11	DESIGN	3	0	0	3

COURSE OBJECTIVES:

COB1: To introduce the principles of vastu

COB2: To gain knowledge on astrology and muhurta in vastu

COB3: To understand the relationship between site and vastu

COB4: To gain knowledge on vastu rules for rooms

COB5: To understand the vastu dosha and its remedies

MODULE I   INTRODUCTION TO VASTU   9

Overview of mythological and scientific background of Vastu - Understanding Life force Energy - Importance of Five Elements - Use of Magnetic Compass - Importance of Cardinal Directions & extensions – energy patterns in vastu.

MODULE II   ASTROLOGY AND MUHURTA IN VASTU   9

Astrological combinations for Vastu – Planetary combination for learning vastu – Bhumi shayan – Ghriarambha Muhurta – Important Rituals at different levels of constructions.

MODULE III   ORIENTATION OF HOME   9

Selection of land - Open Space planning and Building Design - Floor level Height factors – Verandas- Balconies -Porch Basements- Water flow - Mezzanine floors - Plants and Greenery.

MODULE IV   VASTU RULES FOR ROOMS   9

Master Bed Room - Kids room - Living Room- Kitchen- Dining Room – Bathroom - Drawing room - Study Room - Puja Room – Doors - Windows and ventilators - Main Entrance - Staircase – Guest room.

MODULE V   IDENTIFYING VASTU DOSHA AND REMEDIES   9

Use of compass – Points to be checked for the identification of vastu dosha- reading of map – use of Google map – vastu dosha and remedy related to extensions and curtailments – door planning – brahma and marmasthan – distribution of rooms and sitting – sleeping postures.

L - 45; Total Hours – 45

TEXT BOOKS:

1. Ganapati   Sthapati Dr.V, "Sthapatya Veda", Dakshina Publishing house,Chennai, India, 2001.

2. Stella Kramrish, "The Hindu Temple" Volume — I, Motital Banarsidass Publishers, 2002.

3. Subramanya Sastri K.S, "Viswakarma vastusatrum", Thanjavur Maharaja Sarojoji Saraswathl Mahal Library society— Thanjavur, 2006.

REFERENCES:

1. Anand Bhardwaj "Scientific approach to Vastu Shastra" Abhinav Publications; First edition, 2013.

2. Suman Pandit " Golden rules of vastu shastra " Remedies Publishers, 2004

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Summarize the Vastu Principles

CO2: Explain the open space planning and building design to demonstrate the orientation of rooms based on vasthu

CO3: Ascertain the role of vastu in the selection of land and the open space planning

CO4: Explain the building design to demonstrate the orientation of rooms based on vasthu

CO5: Apply the remedies for the various vasthu dosha

Board of Studies (BoS) :   **Academic Council:**

16thBoS of Civil held on 05.01.2022   18th Academic Council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	L	L	L	L	M	L	L	M	L	L	L	L	L
CO2	M	M	L	L	L	L	M	L	L	M	L	L	L	L	L
CO3	H	M	L	L	L	L	M	L	L	M	L	L	L	L	L
CO4	M	M	L	L	L	L	M	L	L	M	L	L	L	L	L
CO5	H	M	L	L	L	L	M	L	L	M	L	L	L	L	L

Note: L - Low Correlation   M Medium Correlation   H - High Correlation

SDG 11 : Sustainable Cities and Communities

Statement : Vastu Sastra explains the concept of sustainable development based on ancient Indian traditional knowledge, through its culture, heritage and orientation towards forest sustainability, as a way to address elements within sustainable development.

HUMANITIES ELECTIVE – (SEMESTER III)

SSDX 01	ENGINEERING ECONOMICS	L	T	P	C
SDG: 4, 8, 9,12	AND MANAGEMENT	3	0	0	3

COURSE OBJECTIVES:

COB1: To present the major concepts and techniques of engineering economic analysis that is needed in the decision making process by providing insights to the basic microeconomic concepts of demand, supply and equilibrium.

COB2: To generate theoretical knowledge and understanding of macroeconomic aggregates such as national income and inflation and the major challenges associated with the measurement of these aggregates.

COB3: To develop analytical and critical thinking skills on money, banking and public finance and use them to judge the appropriateness of economic development and policy options.

COB 4: To introduce the basic concepts of management and planning and highlight the contribution of planning to the attainment of organization's objectives.

COB 5: To apprise the students about important management concepts and create awareness about the corporate social responsibilities and ethical aspects.

MODULE I   DEMAND AND SUPPLY ANALYSIS   9

Introduction to Engineering Economics – Engineering efficiency – Economic efficiency - Scope of Engineering Economics, Engineers' contributions to economic growth- Problem solving and decision making - Laws of Demand and Supply - Difference between Microeconomics and Macroeconomics - Equilibrium between Demand and Supply, Elasticity of Demand - Pricing strategies.

MODULE II   NATIONAL INCOME AND INFLATION   8

Concepts of National Income and measurement – GDP Growth Rate - Importance and difficulties of estimating National Income in India - Aggregate demand and aggregate supply, Macroeconomic equilibrium – Meaning of Inflation, its types causes and preventive measures.

MODULE III   MONEY, BANKING AND PUBLIC FINANCE   10

Money – Meaning, types, functions, importance - Commercial Banks -

Central Bank - Monetary Policy – meaning, objectives, Methods of Credit Control By RBI, Government Budget – Government revenue and expenditures – Fiscal policy - Its objectives, instruments and limitations - Deficit Financing - The Fiscal Responsibility and Budget Management Act, 2003 (FRBMA) – Economic Reforms in India – LPG Policy.

**MODULE IV   PRINCIPLES OF MANAGEMENT AND   8
                     PLANNING**

Nature of management and its process - Importance of Management- Functions and Principles of Management - Nature, Purpose and Kinds of Planning.

MODULE V   ENGINEERING MANAGEMENT   10

Strategic Management-Manager and Environment - Globalization and Technology Intermediation, Corporate Social Responsibility of business - meaning, importance, arguments for and against Corporate Social Responsibility - Business Ethics- Role of Ethics in Engineering Practice- meaning, importance - State intervention in business - Pros and Cons of intervention.

L – 45 ; Total Hours – 45

TEXT BOOKS:
1. Krugman, P, Wells, R, and Graddy, K., "Essentials of Economics", Worth Publishers, 4th Edition, New York, 2016.
2. Hussain, Moon Moon, "Economics for Engineers", Himalaya Publishing House, 1stEdition, New Delhi, India, 2015.

REFERENCES:
1. Andrew Gillespie, "Foundations of Economics", OUP Oxford, England, 2007.
2. Acemoglu, D., Laibson, D., & List, J., "Microeconomics", Pearson Education, 2nd Edition, Boston, 2017.
3. Brinkman John , "Unlocking the Business Environment", Routledge, 1st Edition, London, United Kingdom, 2010.(ISBN 9780340942079)
4. Cleaver Tony, "Economics: The Basics", Routledge, 3rd Edition, London, United Kingdom, 2014.
5. H. L. Ahuja, "Macroeconomics", S Chand Publishing; Twenty Edition, New Delhi, India, 2019.
6. Koutsoyiannis A, "Modern Microeconomics", Palgrave Macmillan, 2nd Edition, U.K, 2003.
7. R.A. Musgrave and P.B. Musgrave, "Public Finance in Theory and

Practice" , McGraw Hill Education India, Fifth Edition, India, 2017.

8. Mell Andrew and Walker Oliver, "The Rough Guide to Economics", Rough Guide Ltd, 1st Edition, London, 2014.

4. R. Paneerselvam, "Engineering Economics", PHI Publication, 2nd Edition, New Delhi, India, 2014.

5. Robbins S.P. Decenzo David A and Coulter, "Fundamentals of Management: Essential Concepts and Applications", Pearson Education, 9th Edition, London, England, 2014.

COURSE OUTCOMES:

On successful completion of this course, students will be able to

CO1:interpret the forces driving demand and supply and their impact on market conditions.

CO2:demonstrate various dimensions of macroeconomic variables like national income, money supply, employment, etc. in analyzing the effects on business.

CO3:explicate the different aspect of Governmental activities and their rationality and describe how they can be pursued through fiscal and monetary policy.

CO4:develop skills to plan, organize, direct and control the resources of the organization for obtaining common objectives or goals.

CO5: augment managerial skills and adopt ethical practices in various functional areas and engineering practices.

Board of Studies (BOS) :   **Academic Council:**

5thBoS of SSSH held on 29.12.2021   18th Academic council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12
CO1		H	H	M		H	H				H	H
CO2		H	M			M					H	H
CO3			M	M		H	H		H			H
CO4						M	H	H	M		M	H
CO5						M	H	H	M		M	H

Note: L- Low Correlation   M - Medium Correlation   H -High Correlation

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

SDG 8: Promote sustained, inclusive and sustainable economic growth, full

and productive employment, and decent work for all.

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

SDG 12: Ensure sustainable consumption and production patterns.

Inclusive and equitable quality education can make a critical difference to production patterns, consumer understanding of more sustainably produced goods, promote inclusive and sustainable economic growth along with productive employment and decent work for all.

| SSDX 02 | SOCIOLOGY OF SCIENCE AND | L T P C |
| SDG: 17 | TECHNOLOGY | 3 0 0 3 |

COURSE OBJECTIVES:

COB1: To recognize and define the basic concepts of society and the ways in which sociologists use these concepts in constructing explanations for individual and group problems.

COB2: To illustrate the convergence and divergence of sociology with engineering subjects in terms of the subject matter, nature and scope of the discipline and its approach.

COB3: To demonstrate the relationship between science, technology and society.

COB4: To understand the issues relating to science, technology and change in India both in the historical and globalization contexts.

COB5: To appraise the impact of science and technology on different socio-cultural institutions and processes.

MODULE I   INTRODUCTION   8

Sociology - Definition, scope and importance, relationship with other social sciences - Major theoretical perspectives: Functionalism, Conflict Theorizing and Interactionism - Elements of social formation - Society, Community, Groups and Association - Institutions, family and kinship, religion, education, politics - Social process - Associative Social Process - Co-operation, Accommodation and Assimilation - Dissociative Social Process - Competition and Conflict.

MODULE II   INDIVIDUAL AND SOCIETY   9

Culture - characteristics, functions, types, cultural lag and civilization - Socialization – process, stages, agencies and anticipatory socialization - Social Control - characteristics, importance, types and agencies - Social stratification. - Meaning, forms - caste and class.

MODULE III   SCIENCE, TECHNOLOGY AND SOCIETY   9

Relationship between society and science and vice-versa - Science as a social system - Norms of science - Relationship between science and technology - History of modern science in India – colonial–independence and post-independence science - Science education in contemporary India – primary level to research level - Performance of universities in the development of technology - Interrelationship between industry and

universities.

MODULE IV SCIENCE, TECHNOLOGY AND SOCIAL 10 ISSUES

Technology, media, identity and global society - Conformity and deviance and role of science and technology - Technology and development issue - S&T and sustainable development -Role of science and technology in the creation of environmental crisis - Social inequality, social exclusion and digital divide - Science, technology and ethical issues -Gender and technology.

MODULE V GLOBALIZATION, SCIENCE, TECHNOLOGY 9 AND CHANGE

Social Change - nature, direction, forms - Technology and rate of social change – Globalization - characteristics, historical and social context- Social consequences of science and technology on civil society - Globalization - Liberalization - Their impact on Indian science and technology - WTO and issues related to intellectual property rights - MNCs and Indian industry.

L – 45; Total Hours – 45

TEXT BOOKS:
1. Giddens A. "Sociology" Wiley India Pvt. Ltd2017
2. Heald Haralambos, R.M "Sociology Themes and Perspectives", Oxford, New Delhi-92. 2014
3. Sergio Sismondo. An Introduction to Science and Technology Studies Malden: Wiley Blackwell.2010
4. R.K. Merton, Sociology of Science, Theoretical and Empirical Investigations, University of Chicago Press, 1973.

REFERENCES:
1. Atal Yogesh, "Changing Indian Society" Rawat Publications, Jaipur, 2006.
2. Bilton, T. et al "Introductory Sociology", Palgrave, New York. 2002
3. Das Gupta, Samir and "An Introduction to Sociology", Pearson, Delhi. 2012.
4. Francis Abraham M. "Contemporary Sociology: An Introduction to Concepts and Theories", New Delhi, Oxford University Press. 2014
5. Inkless, A, "What is Sociology", Prentice Hall, New Delhi. 1987
6. Tumin, Melvin M "Social Stratification", Prentice Hall, New Delhi.

1969.

COURSE OUTCOMES:

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

CO1: recognize the fundamental tenets of Sociology.

CO2: interpret the relationship between individual and society in a sociological perspective.

CO3: categorize and constructively identify their own assumptions about the relationships among society, science and technology

CO4: appraise the dynamics of human society with special reference to the science, technology and contemporary trends of globalization.

CO5: able to link and reflect on current and ongoing sociological debates on development and role of technology.

Board of Studies (BOS) :	**Academic Council:**
5thBoS of SSSH held on 29.12.2021	18th Academic council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12
CO1			H			H	H	M	L	H	L	
CO2			M			H	H	M	H	H	M	L
CO3			H	M	H	H	M		M	H	H	M
CO4			M			H	H	L	L	M	H	H
CO5			M			H				M		L

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

SDG 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development.

To inculcate knowledge and socialize youth in building participation, institutions and partnership for inclusive development for the implementation of sustainable development goals.

SSDX 03

SDG: 8 and 9

INDUSTRIAL ECONOMICS AND MANAGEMENT

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

COB1: To provide a wholesome idea about the concept of industrial economics and identify the classifications of firms based on ownership and control.

COB2: To impart theoretical and analytical knowledge on the different market structures, pricing practices and government policies.

COB3: To equip the students with the framework that will be useful for applying economic models in business strategy, competition policy and regulations.

COB4: To understand the importance of Industrial Policy in the development of Industries in India.

COB5: To elucidate industrial growth in India by examining its performance and problems in industrial sector.

MODULE I   INTRODUCTION TO INDUSTRIAL ECONOMICS   9

Definition and scope of industrial economics - Concept and importance of industry; Concept and organization of a firm - Classification of firms based on ownership - sector (industries, formal vs. Informal) - size and use - based classification - Separation of ownership and control - Localization of industries .

MODULE II   MARKET STRUCTURE   9

Perfect Competition – Imperfect Competition: Monopoly – Monopolistic – Oligopolistic Strategy, Cartels, Cournot Kinked Demand and Price Leadership – Measurement of economic concentration – Policy against monopoly and restrictive trade practices – Competition Law – Pricing Practices: Objectives – Determinants – Pricing Methods – Government Policies and Pricing.

MODULE III   PRODUCTION ECONOMICS AND THEORY OF FIRM   9

Production and Production function – Types, Factor Inputs – Input-Output Analysis**,** Undifferentiated Products - Cournot, Stackelberg, Dominant firm model, Bertrand-Heterogeneous products - Chamberlin's small and large number case - Kinked demand curve theory - Bain's limit pricing – Production Possibility Frontier.

9

MODULE IV   INDUSTRIAL POLICY

Industrial Policy: Industrial Policy in India -1948, 1956, 1977, 1980, 1990, 1991 - Industrial Performance after Independence.

MODULE V   INDUSTRIAL GROWTH IN INDIA   9

Trends and prospects - Public enterprises; efficiency - Productivity and performance constrain - Small scale industries: definition, role - Policy issues and performance - Capacity utilization - Industrial sickness and Exit - Technology transfer - Privatization.

L – 45 ; Total Hours – 45

TEXT BOOKS:

1. Barthwal R R "Industrial Economics: An Introductory Textbook", New Age International Pvt. Ltd Publishers, 2017
2. P.J. Devine, N. Lee, R.M. Jones, W.J. Tyson, "An Introduction to Industrial Economics", Routledge.2019.

REFERENCES:

1. Ferguson, Paul R. and Glenys J. Ferguson, "Industrial Economics - Issues and Perspectives", Macmillan, London. 1994
2. Gregory Mankiw "Principles of Microeconomics", Havcourt Asia Publishers, 2001.
3. Mohanty Binode Ed. "Economic Development Perspectives", Vol. 3, Public Enterprises and Performance, Common Wealth Publishers, New Delhi, 1991
4. Mote and Paul "Managerial Economics, Tata McGraw Hill, 2001
5. Peterson and Lewis "Managerial Economics", 4th Ed., Prentice Hall, 2004

COURSE OUTCOMES:

CO1: Develop knowledge on the concept and organization of firms and the implications of the separation of ownership and control.

CO2: Acquire familiarity with various market structures and formulate appropriate pricing strategies.

CO3: Think analytically using various economic models concerning market structures and apply them to the real world of industry.

CO4: To compare the various Industrial Policies introduced in India and recognize the role of these policies in making required industrial development in India.

CO5: Clearly diagnose and illustrate the challenges in industrial economy in India and develop effective and comprehensive solution on them.

Board of Studies (BoS) :   **Academic Council:**
Mention details of BoS   18th Academic council held on
5thBoS of SSSH held on 29.12.2021   24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1			H	M			H		M		M	L
CO2			H		M		H		M		M	L
CO3			H				H		M		M	M
CO4			H				H		M		H	M
CO5			H				H		M		H	M

Note: L - Low Correlation   M - Medium Correlation   H - 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 sustainable industrialization and foster innovation.

A comprehensive and holistic approach towards the way for sustainable development and economic growth through the inclusive economic strategy and thereby to reduce the poverty, hunger among people by familiarizing them industry and its importance as survival strategy for earning decent standard of living.

SSDX 04

SDG: 10, 16

DYNAMICS OF INDIAN SOCIAL STRUCTURE	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

COB1: To provide knowledge on the components of the Indian social structure.

COB2: To learn the nature and contemporary structure of Indian social institutions.

COB3: To sensitize students about social stratification in Indian Society.

COB4: To create awareness about the social problems occurring in contemporary India.

COB5: To explicate the changing institutions, the processes, the agents and the interventions that brings about change in the Indian society.

MODULE I   INDIAN SOCIAL STRUCTURE   9

Demographic composition - Racial, religious, ethnic and linguistic -Types of communities - rural, urban, agrarian and tribal - Social backwardness - OBC, SC, ST and EWS - Indian minorities- religious, ethnic, linguistic and LGBT.

MODULE II   INDIAN SOCIAL INSTITUTIONS   9

Family - types, characteristics, functions of family - Joint Family- definition features, functions of joint family, dysfunctions of joint family, disintegration of joint family – Marriage - definition, characteristics, marriage as sacrament or contract.

MODULE III   SOCIAL STRATIFICATION IN INDIA   9

Social stratification - Concept of hierarchy - inequality, meaning and characteristics - Social Stratification and Social Mobility - Functions of Social Stratification - Caste, definition, principles, contemporary changes, dominant caste - Caste - class interface - Religious minorities.

MODULE IV   SOCIAL PATHOLOGY   9

Social Problem - nature, social disorganization - Population explosion- causes, effects, relationship with development - Child Labour- causes, magnitude and consequences – Unemployment - nature, types, causes and effects - Gender issues - social status of women, violence against women and women in work place - Contemporary issues - communalism, terrorism and corruption.

MODULE V   SOCIAL CHANGE IN INDIA   9

Socio-cultural change - Sanskritization – Westernization - Secularization, Modernization - Processes of Social change - Industrialization – Urbanization – Globalization - Social movement - concept, characteristics, functions - New social movement-Women and Environment movement.

L – 45; Total Hours –45

TEXT BOOKS:

1. Sharma,K.L., "Indian Social Structure and Change", Jaipur: Rawat Publications, 2008.
2. Ahuja Ram., "Social Problems in India", Rawat Publication: New Delhi, 2014.
3. Ahuja Ram., "Society in India", Rawat Publication: New Delhi, 2014.

REFERENCES:

1. Atal Yogesh, "Changing Indian Society" Rawat Publications, Jaipur, 2006.
2. Dube S.C., "India's Changing Villages: Human Factors in Community Development", London, Routledge and Kegan Paul, 2003.
3. Hasnain N., "Indian Society: Themes and Social Issues", Mc Graw Hill, 2019.
4. Jayapalan, N., **"**Indian Society and Social Institutions" Atlantic Publishers, 2001.
5. Pandey Vinita., "Indian Society and Culture", Rawat Publications, New Delhi, 2016
6. Rao Sankar., "Sociology of Indian Society", S. Chand Publisher, New Delhi, 2004.

COURSE OUTCOMES:

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

CO1: explain about the social structure and social institutions that constitute society in India.

CO2: differentiate the various categories of inequalities and their challenges.

CO3: describe the social stratification and its impact in society.

CO4: analyze the social problems encountered in contemporary India.

CO5: correlate the various forms and trends of the social change in Indian society and realize the relevance of their role in bringing about development.

Board of Studies (BoS) :
5ᵗʰBoS of SSSH held on 29.12.2021

Academic Council:
18ᵗʰ Academic council held on 24.02.2022

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12
CO1			H			H	M			M		
CO2			M			M	H	L				H
CO3			M			M	H	L				H
CO4			H			H	H		M			M
CO5			H		H	M	H	M		H		H

Note: L - Low Correlation   M - Medium Correlation   H - High Correlation

SDG 10: Reduce inequality within and among countries.

SDG16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

To sensitize and impart pertinent knowledge to youths to combat the contemporary issues and challenges facing Indian society in order to remedy its social pathos and injustices in the path of achieving sustainable development in India.