Shivaji University, Kolhapur

DEPARTMENT OF TECHNOLOGY

Four year B.Tech. Course Academic Rules and Regulations

INDEX

Glossary

B. Tech: Bachelor of Technology, an Under Graduate Degree awarded from the Shivaji University, Kolhapur

Director: Director, Department of Technology, Shivaji University, Kolhapur

DC: Department Committee

DEC: Departmental Examination Coordinator

Semester: The academic year shall be divided into two regular semesters of approximately 20 weeks duration each. Typically the odd semester shall be from the first week of July to last week of November while the even semester shall be from the first week of January to the last week of May.

This shall include the period of academic delivery (14 to 15 weeks), Continuous Internal Evaluation (CIE) i.e. Mid Semester Examination and Assignments, Semester End Examination (SEE) assessment and declaration of results.

Course: Subject

Course Coordinator: Subject teacher

Course Credit: Weighted sum of the number of Lecture hours (L), Tutorial hours (T), and Practical hours (P) associated with the course.

Credits Earned: The sum of course credits for credit courses in which a student has passed.

Grade: Assessment of the student's performance in a course indicated by the letters, "AA", "AB", "BB", "BC", "CC", "CD", "DD", "FF", "XX", " ABSENT", "PP", "NP".

Grade Point: Number equivalent of the letter grades given by 10, 9, 8, 7, 6, 5, 4 corresponding to grades "AA", "AB", "BB", "BC", "CC", "CD", "DD" respectively. "FF" and "XX" carry zero grade points.

Instructor: Member of faculty who shall be assigned to teach a specific course.

Semester Grade Points: The sum of the products of credits and Grade Points for each course registered by a student in a semester.

SGPA: Semester Grade Point Average

CGPA: Cumulative Grade Point Average

ATKT: Allowed to Keep Terms.

Shivaji University, Kolhapur
DEPARTMENT OF TECHNOLOGY

Four year B. Tech. Course Academic Rules and Regulations

R.B.T. 1 Admission:

Candidates are admitted to this course according to norms and conditions prescribed as per AICTE, DTE, Maharashtra.

R.B.T. 2 Award of Degree:

Following rules prevail for the award of degree:

1. B.Tech Degree shall be awarded to the student, who has registered and earned all the credits of prescribed courses under the general departmental requirements.

2. In addition to the credit requirement prescribed above for the Degree award, each student shall have to complete the requirements of Audit Course (AC) during the programme. All the students shall receive certification as PP *(for Passed),* and NP *(for not passed)* in AC, in the Grade Card. While obtaining certification as PP is a mandatory requirement for the Degree award of a student, this shall not be taken into account for computing the final Cumulative Grade Point Average.

3. A student has obtained CGPA ≥ 4.5.

4. A student has paid all the institute dues and satisfied all the requirements prescribed.

5. A student has no case of indiscipline pending against him/her.

6. University authorities shall recommend the award of B. Tech. Degree to a student who is declared to be eligible and qualified for above norms.

R.B.T. 3 Attendance Rule:

All students must attend every lecture, tutorial and practical class. However, to account for late registration, sickness or other such contingencies, the attendance requirement will be a minimum of 75% of the classes actually held. A student with less than 75% attendance in a course during the semester, in lectures, tutorials and laboratories taken together (as applicable), will be awarded an 'XX' grade in that course irrespective of his/her performance in the tests.

The course coordinator will award 'XX' grade to the student who is deficient in attendance taking into account the consolidated attendance record for the whole semester. For the purpose of attendance calculation, every scheduled practical class will count as one unit irrespective of the number of contact hours.

Attendance record will be maintained based upon roll calls (or any equivalent operation) in every scheduled lecture, tutorial and practical class. The course coordinator will maintain and consolidate attendance record for the course (lectures, tutorials and laboratories together, as applicable).

R.B.T. 4 Academic Progress Rules (ATKT Rules)

1. A student shall be allowed to register for the courses of the next year's odd semester only if he/she has earned all the credits of the previous year and has not failed in more than three passing heads (SEE, EPE/EOE) shall be considered for deciding the eligibility for ATKT.

2. For the promotion to the Third Year, student should not fail in more than three passing heads (SEE, EPE/EOE) of Second Year and all credits of First Year must be earned.

3. For the promotion to the Final Year, student should not fail in more than three passing heads (SEE, EPE/EOE) of Third Year and all credits of Second Year must be earned.

4. A student who has obtained 'FF' grade in SEE of a regular semester and has obtained 'FF' grade in 2nd attempt of SEE shall be eligible to choose one of the two options below to clear his/her backlog:

    i. Re-registration for the next regular semester course whenever that course is offered.

    ii. Application for Repeated Examination.

5. A student who has detained in a regular semester and obtained 'XX' grade can Re-register for the next regular semester whenever it is offered.

6. The maximum duration for getting B. Tech. degree for students admitted in the first semester of U.G. program shall be 12 semesters (six academic years) while for lateral entry students admitted in the third semester shall be 10 semesters (five academic years) from their date of admission. The maximum duration of the program includes the period of withdrawal, absence and different kinds of leaves permissible to a student but excludes the period of rustication of a student from the Department. If a student is unable to gain all credits of first year in three years from the date of his/her

admission, then he/she shall be declared as "Not Fit for Engineering" leading to discontinuation of his/her registration with the Department.

7. If a student is unable to gain all credits of first year in three years from the date of his/her admission, then he/she shall be declared as "Not Fit for Engineering" leading to discontinuation of his/her registration with the Department.

8. Depending upon the academic progress of a student, Department may take a decision regarding continuation or discontinuation of his/her registration with the institute.

R.B.T. 5 Academic Flexibility

1. Flexibility in deciding Structure and Contents of Curriculum with reasonable frequency for changes in the same.

2. Continuous Assessment of Students performance with newly adopted - Credit System based on Award of Grade.

3. Credits are quite simply a means of attaching relative values to courses different components. They are a currency of learning, and in general regarded as a measure of the time typically required to achieve a given curricular outcome.

4. All subjects (year-wise) under each course/discipline are unitized

R.B.T. 6 Credit system:

Education at the Institute is organized around the semester-based credit system of study. The prominent features of the credit system are a process of continuous evaluation of a student's performance/progress and flexibility to allow a student to progress at an optimum pace suited to his/her ability or convenience, subject to fulfilling minimum requirements for continuation.

A student's performance/progress is measured by the number of credits that he/she has earned, i.e. completed satisfactorily. Based on the course credits and grades obtained by the student, grade point average is calculated. A minimum grade point average is required to be maintained for satisfactory progress and continuation in the program. Also a minimum number of earned credits and a minimum grade point average should be acquired in order to qualify for the degree. All programs are defined by the total credit requirement and a pattern of credit distribution over courses of different categories.

R.B.T. 7 Features of Credit System at Department of Technology, Shivaji University, Kolhapur:

Every subject is allotted credits based on its academic importance/weightage.

1. All subjects may not have same credits.

2. 25 Credits / Semester.

3. Absolute Grading System with 7 Passing Grades viz. AA, AB, BB, BC, CC, CD, DD and FF for failure.

4. Standardization of courses; each course is of 6 units.

5. Continuous Internal Evaluation (CIE) and Semester End Examination (SEE), both having (70:30) weightage in the student's performance in Course Work/Laboratory Work and other activities. A student's performance in a subject shall be judged by taking into account the results of CIE and SEE together. Students must score 40% marks in SEE irrespective of the CIE marks.

   (Note: The CIE shall be conducted as Mid Semester Exam and assignments throughout the semester on dates announced in advance by the department, and its results made known to the students from time to time. However, the dates for the SEE shall be fixed at the University level.)

6. Continuous Internal Evaluation consists of Mid Semester Examination of 20 marks and assignment of 10 marks handled by Department of Technology and setting of question papers should be done by course coordinator. Assignments may be of varied nature for each course based on the need of the course coordinator.

7. Semester-End Examination (SEE), to be conducted by the Department of Technology, Setting of question papers should be done by course coordinator and jointly with an external examiner; this shall include a written examination for theory courses and practical/design/drawing examination with built-in oral part for laboratory/ design/drawing courses.

8. Request for Mid Semester Examination for the students representing in co curricular, extracurricular activities or on medical grounds will be considered only. On receipt of application from the student the DC will take decision for the conduct of the Mid Semester Examination.

9. Care shall be taken to ensure that the total numbers of days for academic work are ≥180 per year.

10. Academic schedule prescribed shall be strictly adhered to all the Branches.

R.B.T. 8 Course credits assignment:

Each course, except a few special courses, has a certain number of credits assigned to it depending upon its lecture, tutorial and laboratory contact hours in a week. This weight-age is also indicative of the academic expectation that includes in-class contact and self-study outside of class hours.

Lectures and Tutorials: One lecture or tutorial hour per week per semester is assigned one credit.

Practical/Laboratory: One laboratory hour per week per semester is assigned half credit.

Example: Course: Concrete Technology: 4 credits (3-0-2)

The credits indicated for this course are computed as follows:

3 hours/week lectures = 3 credits

0 hours/week tutorial = 0 credit

2 hours/week practical = $2 \times 0.5 = 1$ credit

Also, (3-0-2) **4** credit course = (**3** h Lectures + **0** h Tutorial + **2** h Practical) per week

= **5** contact hours per week

R.B.T. 9 Detailed Evaluation Scheme:

1. Out of total 100% theory weightage, 30% weightage is allotted for Continuous Internal Evaluation (CIE). Appearing for CIE is must and student must submit the assignments to become eligible for Semester End Examination (SEE) of respective course.

    CIE (30% weightage) includes:

    a. Mid Semester Exam of 20 Marks of one Hour

    b. Assignment of 10 Marks during entire semester

2. For the Semester End Examination (SEE), 100 marks paper will be set and finally it will be converted to 70 marks, in which student must secure 40% (28 Marks out of 70) as university examination pass head and must appeared for CIE to become eligible for SEE of respective course.

3. Final theory marks (out of 100) will be the addition of CIE (30 Marks) and SEE (70Marks).

4. Final laboratory letter grade will be awarded (100%) will be the addition of CIE (50%) and SEE (50%).

5. Semester End Examination (SEE) for laboratory consists of External Practical Evaluation (EPE)/External Oral Examination (EOE). Continuous Internal Evaluation (CIE) for laboratory consists of Internal Practical Evaluation (IPE) / Internal oral Evaluation (IOE).

6. There shall be no (SEE) for laboratory courses of First Year. The entire assessment of a student shall be based on CIE (IPE/IOE) 100% weightage and a minimum performance of 40% in CIE shall be required to get the passing grade. CIE of laboratory work consists of (IPE/IOE) shall be based on turn-by-turn supervision of the student's work and the quality of his/her work as prescribed through laboratory journals and his/her performance in oral or Practical/Oral examinations uniformly distributed throughout the semester. Student must submit and secure 40% marks in the IPE/IOE of the concerned course. Non submission of IPE/IOE will lead to term not grant (TNG).

7. The assessment of laboratory course from the 3rd semester onwards shall be carried out in two parts.

   i. CIE of laboratory consists of IPE/IOE shall be based on turn-by-turn supervision of the student's work and the quality of his/her work as prescribed through laboratory journals and his/her performance in oral or Practical/Oral examinations uniformly distributed throughout the semester. Student must submit and secure 40% marks in the IPE/IOE of the concerned course. Non submission of IPE/IOE will lead to term not grant (TNG).

   ii. SEE of laboratory shall be based on performing an experiment followed by an oral examination or a written examination.

   iii. The relative weightage for CIE and SEE for assessment of laboratory courses shall be 50% and 50% respectively from second year onwards and a minimum performance of 40% in both CIE and SEE separately shall be required to get the passing grade.

   iv. SEE for laboratory course shall normally be held one week before the SEE for theory courses and shall be conducted by a panel of examiners consisting of external and internal examiner. This activity shall be coordinated by Department

Examination Coordinator (DEC) in consultation with Coordinator of the respective department.

7. A student failed in SEE of a laboratory course in a regular semester shall be eligible to appear for examination conducted along with SEE of laboratory courses of the subsequent semester. Such examination shall be fairly comprehensive (generally of 3 hours similar to EPE/EOE i.e. External Practical/Oral Examinations) to properly judge his/her practical skill and theoretical knowledge for that laboratory course. He/She shall suffer a grade penalty as per Table 3.

8. Assessment of Seminar, Mini-project, Major Project etc:

   i. The Seminar/Project report must be submitted by the prescribed date usually two weeks before the end of academic session of the semester.

   ii. It is desirable that the topics for seminar/project be assigned by the end of previous semester.

   iii. The seminar report and the presentation of seminar shall be evaluated by panel of three departmental faculty members (decided by Branch Coordinator).

   iv. The mini-project shall be evaluated jointly by a panel of three Internal Examiners.

   v. The report on field training shall be evaluated by a panel of three Internal Examiners.

   vi. The assessment of B. Tech major project work shall be carried out in two phases as shown below:

   I-phase CIE (50% weightage) consists of

   a) Departmental Committee (Synopsis submission seminar)

   b) Project work assessment by Guide

   (Departmental Committee consists of following:

   Director- Chairman

   Branch Coordinator from respective branch – member

   Senior faculty from respective branch – member

   Guide/Course Coordinator- member)

   I-phase SEE (50% weightage) consists of Progress Seminar and presentation evaluated by Panel of Internal Examiners.

   II-phase CIE (50% weightage) consists of

   a)   Project work assessment by Guide

b)   Report submission seminar evaluated by Departmental Committee

II-phase SEE (50% weightage) (Final orals and presentations) evaluated by Panel of External and Internal Examiners.

9.   *Semester End Examination duration will be 4 hrs.

10. In respect of CIE, and Laboratory work a target date shall be fixed for the completion of each sheet, job, Project, experiment or assignment and the same complete or incomplete shall be collected on the target date and assessed immediately at the respective departments by the concerned teachers and % marks (or grades) shall be submitted to the Co-coordinator. The Co-coordinator of the Department of Technology shall communicate this % of marks (or grades) to the University within a week after the end of each term.

R.B.T. 10 Earning credits:

At the end of every course, a letter grade is awarded in each course for which a student had registered. On obtaining a pass grade (≥40% minimum grade DD), the student accumulates the course credits as earned credits. A student's performance is measured by the number of credits that he/she has earned and by the weighted grade point average.

The credit system enables continuous evaluation of a student's performance, and allows the students to progress at an optimum pace suited to individual ability and convenience, subject to fulfilling minimum requirement for continuation.

R.B.T. 11 CGPA Improvement Policy for award of degree:

A student getting CGPA ≤ 4.50 with grade 'DD' in any course or grade 'FF' in any course shall have the possibility to repeat one or more 'DD' graded courses along with the failed courses, /are being offered in a semester.

An opportunity shall be given to a student who has earned all the credits required by the respective program with CGPA greater than or equal to 4.00 but less than 4.50, to improve his/her grade by allowing him/her to appear for SEE of maximum two theory courses of seventh and eighth semester.

R.B.T. 12 Evaluation System:

1. **Semester Grade Point Average (SGPA)**

$$= \frac{\sum(\textbf{Course credits in passed courses} \times \textbf{Earned Credits})}{\sum(\textbf{Course credits in registered courses})}$$

2. **Cumulative Grade Point Average (CGPA)**

$$= \frac{\sum(\textbf{Course credits in passed courses} \times \textbf{Earned Credits})\textbf{of all Semesters}}{\sum(\textbf{Course credits in registered courses})}$$

   i.   Cumulative Grade Point Average (CGPA) will be calculated cumulatively for Sem. I to Sem. VIII for regular students.

   ii.   Cumulative Grade Point Average (CGPA) will be calculated cumulatively for Sem. III to Sem. VIII for lateral entry students.

3. At the end of B. Tech Program, student will be placed in any one of the divisions as detailed below :

     Ist Division with distinction   : CGPA $\geq$ 7.5 and above

     Ist Division   : CGPA $\geq$ 6.0 and < 7.5

     IInd Division   : CGPA $\geq$ 5.5 and < 6.0

New gradation suggested as follows.

Table 1

Grade Points	Equivalent Range
5.5	55%
6.0	60%
6.5	65%
7.0	70%
7.5	75%

Conversion of CGPA to percentage marks for CGPA $\geq$ **4.5** can be obtained using equation.

Percentage marks = (CGPA x 10)

An example of these calculations is given below:

Typical academic performance calculations - I semester

Table 2

Course no.	Course credits	Grade awarded	Earned credits	Grade points	Points secured
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6 (col4 *col5)
MALXXX	5	CC	5	6	30
CSLXXX	4	CD	4	5	20
PHLXXX	4	AA	4	10	40
PHPXXX	2	BB	2	8	16
MELXXX	4	FF	0	0	00
TTNXXX	2	AB	2	9	18
Total	21		17	38	124

1. Total Points earned for this semester = 124

$$\textbf{Semester Grade Point Average (SGPA)} = \frac{124}{21} = 5.90$$

2. Cumulative Grade Point Average (CGPA) =

   Cumulative points earned in all passed courses = 124 (past semesters) + 124 (this semester)

$$= 248$$

   Cumulative earned credits = 23 (past semesters) + 21 (this sem.) = 44

$$\textbf{Cumulative Grade Point Average (CGPA)} = \frac{\Sigma(124 + 124)}{\Sigma(23 + 21)} = 5.63$$

Table 3

System of Evaluation

Grade	Grade Points	Marks obtained (%)			Description of Performance
		Regular Semester	Re-examination	Repeated Examination	
AA	10	90-100	--	--	Outstanding
AB	09	80-89	90-100	--	Excellent
BB	08	70-79	80-89	90-100	Very Good
BC	07	60-69	70-79	80-89	Good
CC	06	50-59	60-69	70-79	Fair
CD	05	45-49	50-59	60-69	Average
DD	04	40-44	40-49	40-59	Poor
DD$	04	Below 40	Below 40	Below 40	Poor (Subject to Application of Ordinance 96)
FF	00	Below 40	Below 40	Below 40	Fail
XX	--	--	--	--	Detained
ABSENT	--	--	--	--	Absent
PP	--	--	--	--	Passed (Audit Course)
NP	--	--	--	--	Not Passed (Audit Course)

Note: An equivalent certificate of CGPA to percentage of marks will be provided to student on his/her demand after remitting prescribed fees by Shivaji University.

R.B.T. 13 Entry of Students from Regular Pattern to Credit Pattern

A student of Department of Technology, Shivaji University, Kolhapur admitted before academic year 2020-21, and such student shall clear back log subjects of regular pattern if any, by appearing for respective examination conducted by Department of Technology. Further they shall undergo additional academic requirements (bridge course) if required as suggested by Department committee, so as to have turning with credit pattern.

R.B.T. 14 Audit Courses:

Additional courses shall be included as audit courses from the third semester onwards. While the performance of the student in audited courses shall be included in the Grade Card. These grades are not contributed to SGPA or CGPA of the concerned student.

R.B.T. 15 Awards of Grades for Re-Examination:

- A student who has obtained grade 'FF' in regular semester shall be eligible to appear for re-examination conducted before the commencement of the next regular semester.

- In such cases Continuous Internal Evaluation performance of a student shall not be wiped out.

- A student shall apply for re-examination before the last date of such application and shall appear for re-examination.

- 70% weightage similar to SEE shall be given to re-examination.

- A student who is eligible for re-examination, but remains absent for reexamination shall be given grade 'Absent'.

- A student shall be awarded a grade between 'AB' to 'DD', or 'FF' or 'XX' as given in Table 3 depending upon the cumulative marks obtained by him/her in CIE and Re-examination of SEE. Here a student has to suffer a grade penalty by accepting one grade lower as compared with the regular grades.

R.B.T. 16 Showing Evaluated Semester End Examination Answer Paper, Re-Evaluation, and applying for revaluation:

The evaluated answer book will be shown to the student as per the timetable prepared by the exam cell of DoT after the declaration of result. The grievances regarding the incorrect total and assessment of the not assed questions will be done by the respective faculty on submission of grievance form. A student having doubt regarding the grade declared in a course can apply for the photocopy of the answer book by remitting the prescribed fee as specified; a student can also apply for rechecking of his/her SEE answer book as per Shivaji University norms. There is no provision for showing of evaluated answer book, photocopy and rechecking for revaluation of the reexamination.

R.B.T. 17 Change of Branch:

Students shall be eligible to apply for Change of Branch after completing the first two semesters. The change of branch shall be permitted strictly on merit basis subject to the rules and regulations prescribed by Directorate of Technical Education, Maharashtra State/Admission Regulatory authority, Maharashtra State time to time.

R.B.T. 18 Disciplines and Conduct:

i. Every student shall be required to observe discipline and decorous behavior both inside and outside the campus and not to indulge in any activity, which shall tend to bring down the prestige of the Department.

ii. Any act of indiscipline of a student reported to the Department, shall be referred as per Shivaji University norms.

iii. If a student while studying in the institute is found indulging in anti-national activities contrary to the provisions of acts and laws enforced by Government he/she shall be liable to be expelled from the Department without any notice.

iv. If a student is involved in any kind of ragging, the student shall be liable for strict action as per Maharashtra anti-ragging act 1999, which is in effect from 15th May 1999.

v. If any statement/information supplied by the student in connection with his/her admission is found to be false/ incorrect at any time, his/ her admission shall be cancelled and he/she shall be expelled from the institute and fees paid shall be forfeited.

vi. Student once admitted in the Department of Technology shall follow instructions issued from time to time.

vii. If a student is found guilty of malpractice in examinations then he/she shall be punished as per the recommendations of the Shivaji University, Kolhapur.

viii. Every admitted student shall be issued photo identification (ID) card which must be retained by the student while he/she is registered at Department of Technology. The student must have valid ID card with him/her while in the Department of Technology.

ix. Any student who alters or intentionally mutilates an ID card or who uses the ID card of another student or allows his/her ID card to be used by another student shall be subjected to disciplinary action.

x. The valid ID card must be presented for identification purpose as and when demanded by authorities. Any student refusing to provide an ID card shall be subjected to disciplinary action.

Note: All other rules and regulations will be applicable as per Shivaji University, Kolhapur.

DEPARTMENT OF TECHNOLOGY,
SHIVAJI UNIVERSITY KOLHAPUR
THIRD YEAR B.TECH
Scheme of Teaching and Examination: Semester- V (Civil Engineering)
w.e.f. Academic Year 2022-23

Course Code	Course Title	L	T	P	Credits	Scheme	Max. marks	Min. Passing $	Scheme	Max. marks	Min. Passing
						Theory			**Practical**		
CE 311	Design of Steel Structures	04	-	-	04	CIE	30	40	--------	-------	-
						SEE	70		--------	-------	-
CE 312	Transportation Engineering -I	04	-	-	04	CIE	30	40	--------	-------	-
						SEE	70		--------	-------	-
CE 313	Geotechnical Engineering- I	03	01	-	04	CIE	30	40	--------	-------	-
						SEE	70		--------	-------	-
CE 314	Environmental Engineering-I	04	-	-	04	CIE	30	40	--------	-------	-
						SEE	70		--------	-------	-
CE 315	Construction Management	04	-	-	04	CIE	30	40	--------	-------	-
						SEE	70		--------	-------	-
CE 316	Lab-I Transportation Engineering -I	-	-	02	01	--------	-------	--------	EOE	50	20
CE 317	Lab-II Geotechnical Engineering- I	-	-	02	01	--------	-------	--------	IPE	50	20
									EPE	50	20
CE 318	Lab-III Environmental Engineering-I	-	-	02	01	------	-------	--------	EPE	50	20
CE 319	Seminar	-	-	02	01	--------	-------	--------	IPE	50	20
CE 320	Internship-I	-	-	-	01	-------	------	--------	IOE	50	20
	Total	19	01	08	25	-------	**500**	--------	--------	**300**	-

	Audit Course III										
AC311	Introduction to Foreign Language	**02**	-	-	-	Institute Level	-	-	-	-	-

$ In theory student should appear for the CIE (Mid Semester Exam), submit the assignment and must secure 40% marks in SEE.

Total contact hours per week: **28+2 = 30 and Total Credits = 25**

CIE: Continuous Internal Evaluation SEE: Semester End Examination IPE: Internal Practical Evaluation
EPE: External Practical Examination IOE: Internal Oral Evaluation EOE: External Oral Examination

Note: **1.** Tutorials and Practical to be conducted in batches with batch strength not exceeding 15 students.

2. Under the title of 'Case studies and seminar', every individual student has to select a technical and field relevant case study for seminar and he or she has to deliver the same in the class. This particular activity is equivalent to one Credit and it carries 50 marks as an Internal Oral Evaluation (IOE) which is included in Semester V. The students, besides the seminar delivery, have to submit a brief report (in specified format) on the chosen seminar topic.

3. Internship I, an activity performed after Semester IV will be evaluated as the part of Semester V. It is mandatory for all the students to submit to the institute, the Internship Report duly certified by the concerned organization.

DEPARTMENT OF TECHNOLOGY,
SHIVAJI UNIVERSITY KOLHAPUR
THIRD YEAR B.TECH
Scheme of Teaching with Credits: Semester- V (Civil Engineering)
w.e.f. Academic Year 2022- 23

Course Code	Course Title	Teaching Scheme with Credits (Hours / Week)			
		L	T	P	Credits
CE 311	Design of Steel Structures	04	-	-	04
CE 312	Transportation Engineering –I	04	-	-	04
CE 313	Geotechnical Engineering- I	03	01	-	04
CE 314	Environmental Engineering-I	04	-	-	04
CE 315	Construction Management	04	-	-	04
CE 316	Lab-I Transportation Engineering –I	-	-	02	01
CE 317	Lab-II Geotechnical Engineering- I	-	-	02	01
CE 318	Lab-III Environmental Engineering-I	-	-	02	01
CE 319	Seminar	-	-	02	01
CE 320	Internship-I	-	-	-	01
	Total	**19**	**01**	**08**	**25**

Audit Course III

AC311	Introduction to Foreign Language	**02**	**-**	-	Nil

Total contact hours per week: **28+2 = 30 and Total Credits = 25**

**DEPARTMENT OF TECHNOLOGY,
SHIVAJI UNIVERSITY KOLHAPUR
THIRD YEAR B.TECH**

Scheme of Teaching and Examination: Semester- VI (Civil Engineering)
To be implemented from Academic Year 2022-23

Course Code	Course Title	Teaching Scheme with Credits (Hours / Week)				Examination Scheme (Marks)					
						Theory			Practical		
		L	T	P	Credits	Scheme	Max. marks	Min. Passing $	Scheme	Max. marks	Min. Passing
CE 321	Theory of Structures -II	04	01	-	05	CIE	30	40	IOE	50	20
						SEE	70		--------	-------	--------
CE 322	Water Resource Engineering -I	04	-	-	04	CIE	30	40	--------	-------	--------
						SEE	70		--------	-------	--------
CE 323	Transportation Engineering –II	04	-	-	04	CIE	30	40	--------	-------	--------
						SEE	70		--------	-------	--------
CE 324	Environmental Engineering-II	04	-	-	04	CIE	30	40	--------	-------	--------
						SEE	70		--------	-------	--------
CE 325	Geotechnical Engineering- II	03	01	-	04	CIE	30	40	--------	-------	---------
						SEE	70		--------	-------	---------
CE 326	Lab-I Geotechnical Engineering- II	-	-	02	01	--------	-------	--------	EOE	50	20
CE 327	Lab-II Environmental Engineering-II	-	-	02	01	--------	-------	--------	EPE	50	20
CE 328	Lab-III Structural Design Drawing-I	-	-	02	01	--------	------	-------	IOE	50	20
									EOE	50	20
CE 329	Mini Project	-	-	02	01	--------	-------	--------	IPE	50	20
	Total	**19**	**02**	**08**	**25**	--------	**500**	--------	--------	**300**	--------

	Audit Course IV										
AC321	Research Methodology	**02**	-	-	-	-	-	-	-	-	-

$ In theory student should appear for the CIE (Mid Semester Exam), submit the assignment and must secure 40% marks in SEE.

Total contact hours per week: **29+2 = 31 and Total Credits = 25**

CIE: Continuous Internal Evaluation   SEE: Semester End Examination   IPE: Internal Practical Evaluation
EPE: External Practical Examination IOE: Internal Oral Evaluation   EOE: External Oral Examination

Note: **1.** Tutorials and Practical to be conducted in batches with batch strength not exceeding 15 students
2. Mini project work carried out by a group of students (Preferably maximum 4 students in a group) throughout the semester will be evaluated as an EOE by an external examiner/s. Mini Project report submission and oral presentation by the group is mandatory. The work throughout the semester will be under the supervision of internal teachers with one tutorial per week.
3. There will be at least two industrial visits to reputed Civil industry (1-2 days) in the sixth week of the semester VI. The students will submit a report of the visits. This particular activity is equivalent to one Credit and it carries 50 marks as an Internal Oral Evaluation (IOE) which is included in Semester VI. For submission of the visit report, the students will follow one specific format.
4. Internship II which is part of Semester VII evaluation will be the activity after the SEE of semester VI. It is mandatory for all the students to undergo the same and report to the institute for the semester VII along with the completion certificate by the concerned organization. The students have to submit a hard as well as soft copy of the activity report to the institute.

DEPARTMENT OF TECHNOLOGY

SHIVAJI UNIVERSITY KOLHAPUR
THIRD YEAR B.TECH

Scheme of Teaching with Credits: Semester- VI (Civil Engineering)
To be implemented from Academic Year 2022- 23

Course Code	Course Title	Teaching Scheme with Credits (Hours / Week)			
		L	T	P	Credits
CE 321	Theory of Structures -II	04	01	-	05
CE 322	Water Resource Engineering -I	04	-	-	04
CE 323	Transportation Engineering –II	04	-	-	04
CE 324	Environmental Engineering-II	04	-	-	04
CE 325	Geotechnical Engineering- II	03	01	-	04
CE 326	Lab-I Geotechnical Engineering- II	-	-	02	01
CE 327	Lab-II Environmental Engineering-II	-	-	02	01
CE 328	Lab-III Structural Design Drawing-I	-	-	02	01
CE 329	Mini Project	-	-	02	01
	Total	**19**	**02**	**08**	**25**

Audit Course IV

AC 321	Research Methodology	02	-	-	-

Total contact hours per week: **29+2 = 31 and Total Credits = 25**

Class, Part and Semester	**:**	**Third Year B. Tech (Civil Engineering), Part I, Semester V**			
Course Title	**:**	**Design of Steel Structures**	***Course Code***	**:**	CE 311
Teaching Scheme (Hours)	**:**	Lecture 04Hours/Week Tutorial 00 Hours/Week	***Total Credits***	**:**	04
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10) SEE = 70 Grand Total =100	***Duration of SEE***	**:**	03 Hrs.
Revision	**:**	Second	***Month***	**:**	June 2022
Pre-requisites *(If any)*	**:**	CE212, CE221			
Course Domain	**:**	Core			

Course Rationale: The course deals with design of steel structures using "Limit State Design Method". The design methodology is based on the latest Indian Standard Code of Practice for general construction (IS: 800-2007). The course aims at imparting knowledge and skill of all the necessary components such as material specifications, connections, analysis and elementary design of structural members for designing the steel structures.

Course Objectives: The Course Teacher will		***Course Outcomes:*** Students will be able to	
1.	Make the students familiar with the relevant BIS codes to be used in design of steel structures.	1.	Understand the use of IS Codes related to structural design of steel structures
2.	Clarify the concept of limit state method	2.	Understand the concept of limit state method
3.	Demonstrate the design of bolted and welded connections	3.	Design of bolted and welded connections
4.	Illustrate the design of tension and compression members of steel structures, columns and column bases	4.	Design of tension and compression members of steel structures, columns and column bases
5.	Explain the design of beam and plate girder	5.	Design of beam and plate girder
6.	Demonstrate to prepare the detailed structural drawings of a steel structure	6.	Prepare detailed structural drawings of a steel structure

Curriculum Content	**Hours**
Unit I Introduction to structural design, Structural systems, Roll of the designer, Advantages of steel as a structural material, Types of structural steel, Mechanical properties of steel, various rolled steel sections (including cold-formed sections, structural pipe (tubes) sections and their properties. Codes and specifications. Design philosophies, Limit state method.	06
Unit II i) Bolted connections: Behavior of bolted joints. Design strength of ordinary black bolts, Design strength of ordinary black bolts, Design of simple connections, Beam to beam, beam to column, framed connections. ii) Welded connections: Types and properties of welds, Types of joints, Effective areas of welds,	08

Design of simple connections, Beam to beam, beam to column, framed connections.	
Unit III Design of Tension members: Types of tension members, Slenderness ratio, Behavior of tension members, Modes of failure, Design of angle sections for tension.	06
Unit IV Design of Compression Members: Behavior of compression members, Modes of failure, Classification of cross section, Effective length of compression members, Design strength, Compression members in trusses, Design of columns subjected to axial loads, Laced and Battened columns. Column bases: Slab base and Gusseted base.	13
Unit V Design of beams: Laterally restrained and unrestrained simply-supported beams. Design of Plate girder, Gantry Girder, Plastic analysis of beams and frames.	13
Unit VI Design of Roofing for an industrial building: Roofing materials, Types of trusses, Loading on roof trusses, Analysis of trusses, Design of various members of roof trusses.	06
***Tutorials should be conducted on the basis of solution of design problems.	

Suggested Text Books:

1.	Duggal S. K., "Design of Steel Structures", Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 2008, 3rd Edition.
2.	Bhavikatti S.S., "Design of Steel Structures by Limit State Method", I.K International Publishing

Suggested Reference Books:

1.	Arya A.S. and Ajamani J.L., "Design of Steel Structures", Nemchand and Brothers, Roorkee, 1996, 2nd Edition.
2.	Dayaratnam, "Design of Steel Structures", Wheeler Publishing, New Delhi, 2006, 3rd Edition.
3.	Gaylord E.H. and Gaylord C.N., "Design of Steel Structures", Mc-Graw Hill, New York, 2008, 3rd Edition.
4.	Lothers J.E., "Design in Structural Steel Vol.-I", Prentice Hall New Jersy.
5.	Punmia B.C., Jain and Jain, "Design of Steel Structures", Laxmi Publication, New Delhi, 2008, 2nd Edtion.
6.	Ram Chandra, "Design of Steel Structures, Vol - I and Vol – II", Standard Book House, New Delhi, 2007, 2nd Edition.
7.	Subramanian N., "Design of Steel Structures", Oxford University Press, New Delhi, 2008,

	2nd Edition.
8.	Vazirani and Ratwani, "Design of Steel Structures", Mc-Graw Hill, New York, 2000, 2nd Edition.
9.	Salmon C.G. and Johnson J.E., "Steel Structures: Design and Behavior", Harper and Row, New York, 1995.
10.	"Teaching Resource in Design of Steel Structures", IIT Madras, SERC Madras, Anna Univ., INSDAG, 2007.
Reference Codes:	
1.	IS: 800-2007, Indian Standard code of Practice for use of structural steel in general building construction, BIS – New Delhi (Third Revision).
2.	IS: 875 (Part 1) (1987, Reaffirmed 2008): Code of Practice for Design Loads (Other than Earthquake) For Buildings and Structures. Part 1: Dead Loads - Unit Weights of Building Materials and Stored Materials (Second Revision).
3.	IS: 875 (Part 2) (1987, Reaffirmed 2008): Code of Practice for Design Loads (Other than Earthquake) For Buildings and Structures. Part 2: Imposed Loads (Second Revision).
4.	IS: 875 (Part 3) (2015): Code of Practice for Design Loads (Other than Earthquake) For Buildings and Structures. Part3: Wind Loads (Third Revision).
5.	IS Handbook No. 1- Properties of structural Steel Rolled Section.
6.	Steel Table

Class, Part and Semester	:	Third Year B. Tech (Civil Engineering), Part I, Semester V			
Course Title	:	Transportation Engineering-I		*Course Code*	:	CE 312
Teaching Scheme (Hours)	:	Lecture	04 Hours/Week	*Total Credits*	:	04+00= 04
		Tutorial	00 Hours/Week			
Evaluation Scheme (Marks)	:	CIE= =30 (20+10)	SEE = 70	Grand Total =100	*Duration of SEE*	:	03 Hrs.
Revision	:	Second		*Month*	:	June 2022
Pre-requisites (If any)	:	Geotechnical Engineering.				
Course Domain	:	Core				

Course Rationale: This course is to possess the fundamental knowledge of highway engineering and planning, Highway material properties, bridge engineering, airport engineering.

Course Objectives: The Course Teacher will		*Course Outcomes:* Students will be able to	
1.	To familiarize students with sub-branches of Transportation Engineering such as highway engineering, bridge engineering and airport engineering.	1.	Understand concepts and planning of highway engineering and highway safety.
2.	To make students learn various terminologies related with highway engineering, bridge engineering and airport engineering.	2.	Understand the concepts and analysis of highway geometric design.
3.	To study the various components involved in highway engineering, bridge engineering and airport engineering.	3.	Understand the principles and design of rigid and flexible pavements.
4.	To understand the planning aspect involved in highway engineering, bridge engineering and airport engineering.	4.	Decide the selection of a bridge structures; list the factors affecting, design of a various parameters of bridge structures.
		5.	Design and plan airport, runways terminals buildings, hangers and aprons

Curriculum Content	Hours
HIGHWAY ENGINEERING **Unit I** Introduction Scope of highway engineering, Road development plans, Recent developments – NHAI,NHDP,PMGSY,MSRDC, Highway finance –BOT, Annuity, PPP, DBFO. Planning of highway systems, Highway construction- Types of roads: WBM, BBM, SDBC, DLC and PQC.	06

Unit II Highway Geometric Design: terrain classification, cross-sectional elements highway alignment-definition, requirements, factors controlling alignment, alignment of hill roads., sight distances, horizontal alignments – super elevation, extra widening of pavement on horizontal curve, vertical alignments – gradient, horizontal and vertical curves, grade separation, design problems. Highway drainage- necessity, surface draining, sub-surface drainage. Traffic engineering- traffic characteristics, traffic studies on flow and speed. Peak hour factor, Accidental study, statistical analysis of traffic data, Microscopic and macroscopic parameters of traffic flow, fundamental relationships, Traffic control devices-road marking, traffic sign, signal design by Webster's method, Types of intersection, Highway capacity.	10
Unit III Pavement materials Bituminous materials: types, tests on bitumen, Bituminous mix design: principle, methods and modified binders. Stone aggregates: desirable properties, tests, requirements. Design of pavements Types of pavements, Design steps of flexible highway pavement as per IRC 37-2001 and problems based on CBR method, Design of rigid pavement as per IRC 58-2002, Stresses in rigid highway pavements, Joints in rigid pavements: transverse joints, longitudinal joints, fillers and sealers, Materials and different surfaces and maintenance, Pavement design factors, design wheel load, equivalent single wheel load, repetition of loads, equivalent wheel load factors, strength characteristics of pavement materials, climatic variation.	12
BRIDGE ENGINEERING **Unit IV** Introduction: Classification of bridges, selection of site, Bridge Hydrology: determination of design discharge, water way, spans, location of piers and abutments, afflux, scour, Standards, Specification, loads and forces, erection of superstructure, strengthening, design problems on above topics.	06
Unit V Standard specification for bridges: - IRC loads, Railway bridge loading, forces acting on super structure. Design considerations, aesthetics of bridge design. Types of bridge foundations, Bridge piers, Abutments, Wing walls, bearings. Construction and maintenance of bridges-Introduction; Recent trends in bridges.	06

AIRPORT ENGINEERING	
Unit VI Introduction: Terminology, Airport Classification ICAO, components of an aircraft, aircraft characteristics. Airport Planning: Airport surveys, Site selection, Airport Obstructions, layouts, zoning laws, Environmental considerations. Air Traffic Control: VFR, IFR, Visual aids, airport lighting and marking. Runways: Orientation, wind rose, runway length, Calculations and corrections, Geometric design, Airport capacity, Runway patterns. Taxiways: Layout, geometrical standards, taxiway and exit taxiway design. Terminal Buildings: Site selection, facilities, aprons, parking systems and Heliport.	12

Suggested Text Books:

1.	Khistry, C.J., "Transportation Engineering – An Introduction", Prentice Hall of India Ltd., New Delhi.
2.	Dr. Kadiyali L.R., "Transportation Engineering", Khanna Publishing.
3.	Khanna S.K. and C.E.G. Justo, "Highway Engineering", Nem Chand and Bros., Roorkee.

Suggested Reference Books:

1.	Yang H. Huang, "Pavement Analysis and Design", Prentice-Hall.
2.	A. K. Upadhyay., "Highway Engineering", Katson Books.
3.	Wright, "Highway Engineering", 7th Edition WILEY.
4.	Partha Chakroborty and Animesh Das, "Principles of Transportation Engineering", Prentice-Hall India, New Delhi. India.
5.	S.P. Bindra., "Bridge Engineering".
6.	S.K. Sharma., "Highway Engineering".
7.	Ponnuswamy S., "Bridge Engineering", Tata McGraw Hill Publications.
8.	Khanna S.K., Arora M.G. and Jain S.S., "Airport Planning and Design", Prentice-Hall India,
9.	Rao G.V., "Airport Engineering", Tata McGraw Hill.

	References Codes:
1.	IRC: 76-1979 – Tentative Guidelines for Structural Strength Evaluation of Rigid Airfield Pavement - Indian Roads Congress -IRC, New Delhi.
2.	IRC: 85-1983 – Code of Practice for Accelerated Strength Testing and Evaluation of Concrete Road and Air field Constructions- Indian Roads Congress -IRC, New Delhi.
3.	IRC: 37-2001 – Guidelines for the Design of Flexible Pavements for Highways-Indian Roads Congress-IRC, New Delhi.
4.	Indian Roads Congress -IRC, New Delhi.
5.	IRC: 58-2002 (Second Revision) – Guidelines for the Design of Rigid Pavements for Highways.

Class, Part and Semester	:	**Third Year B. Tech (Civil Engineering), Part I, Semester V**			
Course Title	:	**Geotechnical Engineering-I**	*Course Code*	:	CE 313
Teaching Scheme (Hours)	:	Lecture	03Hours/Week	*Total Credits*	:	3+1=4
		Tutorial	01 Hours/Week			
Evaluation Scheme (Marks)	:	CIE=30 (20+10)	SEE = 70	Grand Total =100	*Duration of SEE*	:	03 Hrs.
Revision	:	Second			*Month*	:	June 2022
Pre-requisites (If any)	:	Basic Civil Engineering ,Building Construction material				
Course Domain	:	Core				

Course Rationale: Geotechnical Engineering forms a core subject, taught to all students of the civil engineering. The study of this course is aimed at developing a thorough practical understanding of the basic behaviour of soil through simple experiments on different sample.

Course Objectives: The Course Teacher will		*Course Outcomes:* Students will be able to	
1.	To provide a coherent development to the students for the courses in sector of Geotechnical Engineering and Soil Improvement Techniques etc.	1.	Able to evaluate the Index and Engineering properties of soil and Understand the fundamental relationships in properties of soils
2.	To present the foundations of many basic Engineering tools and concepts related Geotechnical Engineering.	2.	Evaluate the stress calculations in soil under different soil conditions
3.	To give an experience in the implementation of Engineering concepts which are applied in field of Geotechnical Engineering	3.	Understands the process and importance of compaction and consolidation
4.	To inform student about estimation of stress in soil and earth pressure on retaining structures for different soil states.	4.	Know the shear strength of soil and its determination and to Analyze the lateral pressure on vertical retaining walls

Curriculum Content	Hours
Unit I Properties of Soil Introduction to Soil Mechanics, major soil deposits of India, soil types such as marine deposits, black cotton soils, lateritic soils, alluvial deposits and desert soils etc. Three phase soil system, structure of soil, particle size and shape, weight volume relationships, index properties of soil, methods of determination and its significance, I.S. classification of soil, field identification of soils. Atter berg's consistency limits (Liquid limit, plastic limit, shrinkage limit), Consistency indices.	07
Unit II Permeability and Seepage Permeability of soil, Capillary water, Darcy's law. Factors affecting permeability. Determination of permeability by constant head and falling head method as per IS - 2720, field test as per IS – 5529 (part I)- pumping in test and pumping out test. Permeability of stratified (layered) soils. Concept of total stress, Pore pressure and effective stress, Different forms of water, Seepage	06

pressure, Seepage force, Seepage force per unit volume, Critical hydraulic gradient, quick sand condition. Uplift pressure, exit gradient, failure due to piping, General flow equation. Flow net construction and characteristics, Applications of flow net, Determination of seepage loss	
Unit III Compaction and Consolidation Concept of compaction, factors affecting compaction, Standard proctor test and modified proctor test as per IS 2720, Dry density and moisture content relationship, Zero air void line, Placement water content, Field compaction control, Field compaction equipment with their suitability, Concept of consolidation, Factors affecting consolidation, Terzaghi's piston and spring analogy model, Terzaghi's theory of one-dimensional consolidation, Lab consolidation test to find coefficient of consolidation, Coefficient of volume change, Compression index, Coefficient of compressibility, NCC, UCC, OCC, Determination of coefficient of consolidation by square root of time fitting method and logarithm of time fitting method.	07
Unit IV Shear Strength of Soil Concept of shear stress and shear strength, Mohr-Coulomb's theory and failure envelopes for different types of soils such as C-soil, -soil, and C- soils, Representation of stress on Mohr's circle, Terzaghi's total stress and effective stress approach, Factors affecting shear strength of cohesive and cohesionless soils, Determination of shear strength of soil by Direct shear test, Triaxial compression test, under UU, CU and CD conditions, Unconfined compression test and vane shear test, Sensitivity, Skempton pore water pressure parameters	06
Unit V Stress Distribution in Soils Bousinessq theory assumptions and application to point load, Strip load, Circular sections, Pressure distribution diagrams on horizontal and vertical plane, Radial shear stress, Isobars and pressure bulbs, Use of Newmark's charts, Westergaard theory assumptions and application to uniformly loaded rectangular area.Contact pressure for different footings in different soils, Equivalent point load method for stress calculation, Approximate method (2V:1H) method for stress calculation.	07
Unit VI Earth Pressure Theory Concept of earth pressure, Plastic equilibrium, Earth pressure at rest, Active and passive condition, its practical applications. Rankine's earth pressure theory for cohesionless soils under dry, Partially and fully submerged condition, Horizontal back fill with surcharge, Total lateral force on wall, Bell-Rankine's theory for cohesive soils under dry, partially and fully submerged condition, tension cracks in soil, Critical height, Coulomb's wedge theory for earth pressures.	06
Suggested Text Books:	

1. "Soil Mechanics and Foundation Engineering" - B. C. Punmia, Laxmi Publication
    2. "Soil Mechanics and Foundation Engineering" - K. R. Arrora, Standard Publisher
    3. "Soil Mechanics and Foundation Engineering" - V. N. S. Murthy, Marcell Decker
    4. "Basic and Applied soil Mechanics" - A. S. R. Rao and Gopal Ranjan, New age International Publication
    5. "Geotechnical Testing and Instrumentation" - Alam Singh, CBS Publisher
    6. "Geotechnical Engineering" - C. Venkatramaiah, New age International Publication
    7. "Geotechnical Engineering" - Purushottam Raj	

Suggested Reference Books:	
1. "Soil Mechanics" - Terzaghi and Peak, Jony Willey and Sons, New York 2. "Soil Testing" - T. W. Lambe, Willey Eastern Ltd, New Delhi	

Class, Part and Semester	:	Third Year B. Tech (Civil Engineering), Part I, Semester V				
Course Title	:	Environmental Engineering -I		*Course Code*	:	CE 314
Teaching Scheme (Hours)	:	Lecture	04Hours/Week	*Total Credits*	:	04
		Tutorial	00 Hours/Week			
Evaluation Scheme (Marks)	:	CIE=30 (20+10)	SEE = 70	Grand Total =100	*Duration of SEE*	:	03 Hrs.
Revision	:	Second			*Month*	:	June 2022
Pre-requisites (If any)	:	Chemistry, Basic Civil Engineering				
Course Domain	:	Core				

Course Rationale: The course has prime importance to acquit knowledge of air pollution and water treatment.

Course Objectives: The Course Teacher will		*Course Outcomes:* Students will be able to	
1.	To demonstrated in-depth knowledge within environmental engineering and an awareness of potential social, economic, political, and environmental impacts of engineering practices	1.	To get knowledge of air and noise pollution
2.	An appreciation of the contribution of environmental engineers to the benefit of society and the responsibilities of a professional environmental engineer.	2.	To make the students familiar with sources and demand of water.
3.	To study the basic characteristics of water and its determination.	3.	To understand the basic characteristics of water and its determination.
4.	To study the design of water supply lines.	4.	To expose the students to understand the design of water supply lines.
5.	To study and design the various treatment processes for water treatment.	5.	To provide adequate knowledge about the water treatment processes and its design.
6.	To study and design Water Supply Scheme.	6.	To have adequate knowledge on operation and maintenance of water supply and leakage detection and prevention.

Curriculum Content	Hours
Unit I Air Pollution-Definition, sources of air pollution, types and classification of air pollutants, Primary and Secondary air pollutants and their importance, Atmospheric stability, mixing heights, plume types and meteorological parameters. Effects of air pollution on –Human, Animals, Materials and Vegetation. Global Effects-Photochemical smog, heat island, ozone depletion, acid rain. Control of air pollution. Noise Pollution-Soures, effects and Control.	**08**

Unit II Sources of water, Factors considered in selection of source of water for treatment plant, Conveyance of raw water-, canals and pipelines, Hydraulics of conduits, Different types of pipes used and their suitability, designing of rising main., intake structure, different types of intake structures. Quality-Characteristics, Indian standards, Testing of raw water for physical, chemical and bacteriological parameters and their significance.	**08**
Unit III Quantity-Population forecasting,different methods of population forecasting, rate of water consumption for various purposes, factors affecting demand of water, calculation of fire demand. Water Treatment: Necessity of water treatment processes. Different types of water treatment flow sheets. Aeration: Principle and Concept, Necessity, Methods, Design of cascade aerator.	**09**
Unit IV Sedimentation-Theory of sedimentation, types of suspended solids, determination of Settling velocity, Types of sedimentation tanks. Surface Loading, detention time, and design of PST, inlets and outlets arrangements Theory of chemical coagulation, Factors affecting coagulation, turbidity, rapid mixing, coagulant dosage, characteristics of water, optimum pH, Coagulant aids, choice of coagulants, common coagulants, coagulant aids like Bentonite clay, lime stone, silicates and poly electrolytes Rapid mixing -Necessity, gravitational, mechanical, pneumatic devices, Slow mixing and flocculation, design of flocculation chamber, mean velocity gradient "G" and power consumption, Concept of Plate settler and Tube settler.	**09**
Unit V Filtration: Theory of filtration, Mechanism of filtration, filter materials, Types of filters-Rapid gravity filter, slow sand-filter and pressure filter. Components, materials, underdrainage system, working and cleaning of filters, operational troubles, Design of filters. Theory of disinfection-Factors affecting efficiency of disinfection. Types of disinfectants, Mathematical relationship governing disinfections variables. Theory of chlorination, break point chlorination, bleaching powder estimation.Water softening methods-lime-soda, ion exchange method and Demineralization.	**09**
Unit VI System of water supply-Continuous and intermittent system. Distribution of water-Different distribution systems and their components, layouts, Methods of supply like gravity, pumping and combination, Design of distribution system, determination of Balancing Capacity of ESR , Wastage and leakage of Water-Detection and Prevention, Water audit and Energy Audit Introduction of hydraulic modeling software's	**09**
Suggested Reference Books:	
1. H. V. N. Rao and M. N. Rao, "Air Pollution", TMH Publications.	

2.	S. K. Garg, "Water Supply Engg. Khanna Publishers –New Delhi.
3.	Peavy and Rowe, "Environmental Engg. McGraw Hill Publications
4.	Stern,"Air Pollution Vol. I –IV", McGraw Hill.
5.	Sharma and Kaur, "Environmental Chemistry", Goyal Publisher.
6.	Water Supply and Treatment Manual: Govt. Of India Publication.
7.	Steel and McGhee, "Environmental Engineering", McGraw Hill Publications.
8.	Duggal K. N., "Water Supply", S. Chand and Company, 2007.
9.	Fair G. M, Geyer J. C, and Okun D. A, "Water and Waste Water Engineering Vol. I and II", John Wiley Publication, 1966.
10.	Hammer M. J., "Water and Waste Water Technology", Prentice Hall of India Private Limited, 1996.
11.	Viessman W. and Hammer M. J, "Water Supply and Pollution Control", Harper Collins College Publishers, 1993.

Class, Part and Semester	:	Third Year B. Tech (Civil Engineering), Part I, Semester V			
Course Title	:	**Construction Management**	*Course Code*	:	CE 315
Teaching Scheme (Hours)	:	Lecture 04Hours/Week Tutorial 00 Hours/Week	*Total Credits*	:	04
Evaluation Scheme (Marks)	:	CIE=30 (20+10) SEE = 70 Grand Total =100	*Duration of SEE*	:	03 Hrs.
Revision	:	Second	*Month*	:	June 2022
Pre-requisites (If any)	:	-			
Course Domain	:	Core			

Course Rationale: To make understand students importance and implementation of 1) management in construction industry with specific focus on logic of CPM and PERT. 2) Economic aspects and comparision 3) Applications of softwares like MSP and Primavera in construction industry.

Course Objectives: The Course Teacher will		*Course Outcomes:* Students will be able to	
1.	To familiarize students with basic concepts in Engineering management.	1.	Understand concepts in Engineering management.
2.	To understand management from various resources point of view like Material, Money, and Men required on site.	2.	Understand the concepts and analysis of resource management on site
3.	To study the various aspects of financial management and economic comparision in construction industry.	3.	Understand the financial concepts and economic comparision relating to construction industry.
4.	To understand the various on-site aspects like safety Engineering and details of safety programs.	4.	Understand the importance of safety Engineering and details of safety programs on site.
5.	To familiarize students to software - MSP and Primavera.	5.	Understand the software from implementation point of view.

Curriculum Content	Hours
Unit I Introduction to Management, steps in Project Management - work break down structure, Bar Chart, Mile stone chart, Gantt Chart. Activity on Arrow and Activity on Node **Introduction to PERT**: Concept of probability, normal and Beta Distribution, Central limit theorem. Time estimates and calculations of project duration, critical path, slack, probability of project completion. (Problems).	09
Unit II **CPM:** Introduction, Time estimates, floats, critical path. Network compression – Least Cost and optimum duration. Resource allocation-Smoothening and leveling.	09

Updating of networks– needs, steps, project duration, and calculation for updated network. (Problems) Comparision of PERT and CPM	
Unit III Resource Management Men- Resource allocation - smoothening and leveling. Material Management- definition by international federation of purchasing and material management. Objectives. Role Functions, Qualities of Material Manager, Material forecasting. Inventory Control- Necessity, Techniques such as ABC, EOQ, HML, VED, SDE, etc., lead-time, safety stocks. Assignment and Transportation Problems.	09
Unit IV Financial Management Objectives, managing working capital, Preparation of cash flow schedule based on funds available and project planning. Law of Diminishing Marginal Utility, Law of Substitution. Introduction to Engineering economics, importance, demand and supply, types of costs, Supply and Demand. Interest - simple, compound, continuous, effective. Value of Money - time and equivalence, tangible and intangible factors, introduction to inflation. Interest factors - Uniform series factors - derivations.	08
Unit V Economic comparisons Discontinuing methods : Present worth method, equivalent annual cost method, capitalized cost method, net present value, internal rate of return, Benefit Cost Ratio, Payback Period Method	09
Unit VI Site Layout Factors affecting, Typical layout of construction project. Safety Engineering -Accident cost, Injury sources and causes, Preparation of safety programs for construction works. Introduction to MSP software- Concept of Project and Portfolio management Introduction to Primavera software, Comparision between MSP and Primavera.	08

Suggested Text Books:

1.	Punmia B.C., "CPM PERT" Trinity Press, Laxmi Publications.
2.	Chitkara, "Construction Project Management", Tata MC Graw Hill
3.	S. Seetharaman, "Construction Management", Umesh Publications S.B. Nath Market, N. Delhi.

Suggested Reference Books:

1.	Antill and Woodhead, "C.P.M. in Construction Practice",
2.	Barrie Paulsion, "Professional Construction Management", McGrew Hill Institution Edition. Graw Hill.
3.	Carl Chatfield and Timothy Johnson "Microsoft Project 2016 Step by Step".
4.	Gopalkrishnan and Sunderasan, "An Integrated Materials Management".

5.	K.S. Menon, "Purchasing And Inventory Control", Wheelar Publication.
6.	Layland Blank and Torquin, "Engineering Economics".
7.	Zamb L.C., "Inventory Control"
8.	Senagupta, "Construction Management and Planning", Tata McGraw Hill Publication
9.	Taylor G.A., "Management and Engineering Economics" 17.
10.	Pilcher R., "Principles of Construction Management"

Class, Part and Semester	:	Third Year B. Tech (Civil Engineering), Part I, Semester V			
Course Title	:	**Transportation Engineering- I Laboratory**	*Course Code*	:	CE 316
Teaching Scheme (Hours)	:	Practical	2Hours/Week	*Total Credits*	:	01
Evaluation Scheme (Marks)	:	IOE = 00	EPE =50	Grand Total = 50	*Duration of EPE*	:	02Hrs.
Revision	:	Second		*Month*	:	June 2022
Pre-requisites (If any)	:	Geotechnical Engineering.			
Course Domain	:	Core			

Course Rationale:
This course is to possess the knowledge of highway pavement materials, design of pavement and design of airport elements.

Course Objectives: The Course Teacher will to		*Course Outcomes:* Students will be able to	
1.	Familiarize students to procedure about the conducting test on highway materials.	1.	Aware about the procedure adopted for conducting test on highway materials.
2.	Learn the objectives of conducting various tests on highway materials.	2.	Learn the objectives of conducting various tests on highway materials.

General Instructions: Any 8 experiments to be performed from the list, any 2 experiments to be studied as demonstration.

Sr. No.	List of Experiments	
A	**Test on Aggregates**	
	1	Specific Gravity and Water Absorption Test.
	2	Impact Value.
	3	Abrasion Test.
	4	Crushing Test.
B	**Test on Bituminous Materials**	
	1	Bitumen Penetration Test.
	2	Softening Point.
	3	Flash Point and Fire Point Test.
	4	Ductility test.
	5	Viscosity Test.
	6	Stripping value Test.
	7	Bitumen Extraction Test.

C		Assignments on each unit including design problems as follows
	1	Design of Flexible Pavement.
	2	Design of Rigid pavement.
	3	Airport Engineering.
D		**Industrial visit with report (Any Two)**
	1	Visit to Hot mix plant.
	2	Visit to Road construction work
	3	Visit to AirPort
	4	Visit to Bridge.
Suggested Text Books/ Reference Books/Manual		
1.		Sayed Danish Hasan., "Civil Engineering Materials and their Testing", Narosa Publishing House

Class, Part and Semester	:	**Third Year B. Tech (Civil Engineering), Part I, Semester V**				
Course Title	:	**Lab-II Geotechnical Engineering –I**		***Course Code***	:	**CE 317**
Teaching Scheme (Hours)	:	Practical	2Hours/Week	***Total Credits***	:	01
Evaluation Scheme (Marks)	:	IOE = 50	EPE =50 / Grand Total = 100	***Duration of EPE***	:	02Hrs.
Revision	:	Second		***Month***	:	June 2022
Pre-requisites (If any)	:	Basic Civil Engineering.				
Course Domain	:	Core				

Course Rationale: Geotechnical Engineering forms a core subject, taught to all students of the civil engineering. The study of this course is aimed at developing a thorough practical understanding of the basic behaviour of soil through simple experiments on different sample.

Course Objectives: The Course Teacher will		***Course Outcomes:*** Students will be able to	
1.	Determination of index and engineering properties of soil.	1.	Demonstrate the experiments for characteriz of different soils.
2.	Classification of soil on the basis of different classification systems.	2.	Should Classify soil type.
3.	Able to find Field Density	3.	Lab method to find Density
4.	To understand Shear Strength	4.	Using Experimental setup should find Shear Strength

General Instructions: Any 8 experiments to be performed from the list, any 2 experiments to be studied as demonstration.

Sr. No.	*List of Experiments*
1.	To Determine the water content of the given sample
2.	Determination of the specific gravity of the given soil sample
3.	Grain size distribution of soil by the Mechanical Sieve Analysis.
4.	Determination of the Atterberg Limits of the Soil Sample : Liquid Limit, Plastic Limits and shrinkage limit (at least two) of the given soil sample
5.	Determination of the field density by Core Cutter / Sand Replacement Method
6.	To Determine Coefficient of Permeability of The Given Soil Sample By Permeability Test
7.	To Determination of the Optimum Moisture Content by Proctor Test
8.	To determine the shear strength of the soil by the Direct Shear Test
9.	Particle size distribution-Sedimentation analysis (hydrometer)
10.	Unconfined Compression Test and Triaxial shear test.
11.	One dimensional consolidation test.

II) Industrial visit	
1. Visit to Earthwork site to study soil properties.	
Suggested Text Books/ Reference Books/Manual	
1.	Soil Mechanics and Foundation Engineering by K. R. Arora, (Standard Publication)
2.	Text book of soil mechanics in theory and practice by Dr. Alam Singh(Asian Publishing House, Bombay)
3.	Soil mechanics and Foundation engineering by V. N. S. Murthy. (U. B. S. Publishers and distributors New Delhi)
4.	Soil mechanics and Foundation engineering by B. C. Punmia.(A Saurabh and Company Pvt. Ltd. Madras)

Class, Part and Semester	:	Third Year B. Tech (Civil Engineering), Part I, Semester V				
Course Title	:	Lab-III Environmental Engineering-I		*Course Code*	:	CE 318
Teaching Scheme (Hours)	:	Practical	2Hours/Week	*Total Credits*	:	01
Evaluation Scheme (Marks)	:	IOE Nil	EPE =50	Grand Total =50	*Duration of EPE* :	02Hrs.
Revision	:	Second		*Month*	:	June 2022
Pre-requisites (If any)	:	Chemistry				
Course Domain	:	Core				

Course Rationale: The course has prime importance to acquit knowledge of air pollution and water treatment.

Course Objectives: The Course Teacher will		*Course Outcomes:* Students will be able to	
1.	To provide students with basic understanding of physical chemical and biological properties of water samples also the basic knowledge in engineering design of water supply systems.	1.	Students will be aware about the procedure adopted for conducting test on water samples.
2.	An appreciation of the contribution of environmental engineers to the benefit of society and the responsibilities of a professional environmental engineer.	2.	Students will learn the objectives of conducting various tests on Environmental engineering-I.

A.

General Instructions: Any 10 experiments to be performed from the list, any 2 experiments to be studied as demonstration.

Sr. No.	*List of Experiments*
1	pH and Alkalinity
2	Hardness
3	Chlorides
4	Chlorine demand and residual chlorine
5	Turbidity and optimum dose of alum
6	Sulphates
7	Fluorides

8	Iron
9	Most Probable Number (MPN)
10	.Ambient air quality monitoring for PM10/PM2.5, SO2 and NOx.
11	Measurement of noise levels at various locations using sound level meter, Calculate cumulative noise level at any one location.
12.	Site visit to water treatment plant: A report based on the visit to water treatment plant would be submitted and would form a part of the term work.
B	Site visit to water treatment plant: A report based on the visit to water treatment plant would be submitted and would form a part of the term work.
C	Design of water Supply scheme using relevant software's.

Class, Part and Semester	:	Third Year B. Tech (Civil Engineering), Part I, Semester V			
Course Title	:	**Seminar**		*Course Code*	:	CE 319

| *Teaching Scheme (Hours)* | : | Lecture | 00Hours/Week | *Total Credits* | : | 01 |
| | | Tutorial | 01 Hours/Week | | | |

| *Evaluation Scheme (Marks)* | : | IOE=50 | EPE/EOE = Nil | Grand Total =50 | *Duration of SEE* | : | NA |

| *Revision* | : | Second | | *Month* | : | June 2022 |

| *Pre-requisites (If any)* | : | Pre-requisites include basic knowledge of soft skills, presentation and familiarity of Civil engineering field overview |

| *Course Domain* | : | Presentation and Communication skills |

Course Rationale: The purpose of this course is to provide an overview of recent trends and debates on the case study in civil engineering.

Course Objectives: The Course Teacher will	*Course Outcomes:* Students will be able to
1. Promote self-study, critical thinking and independent research ability by developing student's skills in: problem solving, self-learning, decision making in critical situations and Improving research ability.	1. Understand and analyze the scientific challenges through the various case studies undergone.
2. Encourage and assess student's case study analysis.	2. Achieve higher level of competency for any seminar and presentation
3. Impart the knowledge for improvement in the collection of scientific data for assigned case study.	3. Develop their overall personality by carving their presentation, aptitude, and research skills.
4. Encourage the students to broaden their knowledge base upon their interest in studies and encourage them to present case studies confidently.	4. Acquire the skills required for working together as a team to get benefited in terms of facilitates idea generation, Motivated, moral support, and high risk capability.

Curriculum Content	Hours
Unit I Seminar 1. Selecting the seminar topic. 2. Information retrieval (literature survey) a) Source of Information i.e. names of the journals, reports, books, etc. b) Searching for the information i.e. referring to civil research, etc. 3. Preparing the seminar report 4. Presentation of the seminar	08
Unit II Case Studies Find the recent data about 2-3 cases by referring to civil engineering research and journals and prepare brief report on it.	10

Class, Part and Semester	:	Third Year B. Tech (Civil Engineering), Part I, Semester V				
Course Title	:	**Internship I**		*Course Code*	:	CE 320
Teaching Scheme (Hours)	:	Practical	2Hours/Week	*Total Credits*	:	01
Evaluation Scheme (Marks)	:	IOE = Nil	EOE=50	Grand Total = 50	*Duration of EOE*	:	05Hrs. for Entire class
Revision	:	Second		*Month*	:	June 2022
Pre-requisites (If any)	:	The pre-requisite for this course is to have the idea of the overview of the fundamental courses of Civil Engineering.				
Course Domain	:	Core				

Course Rationale: The purpose of this course is to expose the students for identification of knowledge and skills essential to do well in a particular profession by hands on experience in industry for a month.

Course Objectives: The Course Teacher will		*Course Outcomes:* Students will be able to	
1.	Demonstrate and expose students to the 'real' working environment to get acquainted with the organization structure, business operations and administrative functions;	1.	Understand actual working environment.
2.	promote hands-on experience in the students' related field so that they can relate and reinforce what has been taught at the university;	2.	Acquire ability to utilize technical resources and use the new ways of learning and thinking.
3.	Develop synergetic collaboration between industry and the university in promoting a knowledgeable society.	3.	Prepare the technical documents and make oral presentations related to the task assigned.
4.	Assist in providing the opportunity for students to test their interest in a particular career before permanent commitments are made.	4.	Develop attitude of a team player and aptitude for lifelong learning

Course Description

The primary objective of internship is to expose students to meaningful and relevant workplace attachment to better connect their learning to the workplace and deepen their skills, so that they are better prepared for their transition to the workplace after graduation.

As a part of the B.Tech Civil Technology curriculum, 'CE 320 Internship I' is similar to a practical course, which the students of Civil Technology must undergo in reputed Private / Public Sector / Government organization / companies as an Internship of minimum Four weeks after the IV Semester End Examination i.e. during the summer session after their Second Year B. Tech and Prior to the commencement of Third Year B. Tech

Class, Part and Semester	:	**Third Year B. Tech (Civil Engineering), Part I, Semester V**						
Course Title	:	**Introduction To Foreign Language**			***Course Code***	:		AC311
Teaching Scheme (Hours)	:	2 hr. /week= 2 x 14= 28 hours			***Total Credits***	:		Nil
Evaluation Scheme (Marks)	:	Assignments : 50 Viva-voce : 25		Written Test : 25 Grand Total : 100		***Duration of SEE***	:		Not Applicable
Revision	:	Second			***Month***	:		June 2022
Pre-requisites *(If any)*	:	No						
Course Domain	:	Language						

Course Rationale: This course provides a competitive edge for engineering graduates in their career choices. They will be able to communicate in a second language. The course enhances listening, reading skills and memory. Our graduates may be able to participate more effectively and responsibly in a multi-cultural world if they know another foreign language in addition to the English.

Course Assessment Methods: The students will be given five assignments each for 10 marks. At the end of the course, there will be a written test of 25 marks and a viva voce of 25 marks. There will be assessment for a total of 100 marks. Based on the marks obtained, they will be awarded with a grade similar to other credit courses. Though it is an audit course, obtaining passing grade is essential.

Course Objectives: The Course Teacher will		***Course Outcomes:*** Students will be able to	
1.	Help students to understand basics and deepen their knowledge in a chosen foreign language.	1.	Learn alphabets and acquire knowledge of basic grammar of the foreign language, common words and phrases therein.
2.	Guide them to communicate and translate in the chosen foreign languages.	2.	Learn to read the simple texts in foreign language.
3.	Help them describe, narrate, and ask/answer questions in the foreign language in the present time about a variety of topics related to family, daily activities, eating, and traveling.	3.	Speak a little using the greetings, well wishes etc. in Foreign Language.
4.	Comprehend the foreign language with sufficient ability to grasp the main idea and some supporting details in short conversations (spontaneous or recorded) that pertain to the topics mentioned above.	4.	Count numbers, answer to the questions like, what is your name, surname, tell age, and can initiate little communication in Foreign Language.
5.	Explain how to write sentences and short paragraphs on familiar topics relating to personal interests and practical needs.	5.	Translate both verbally and written, simple sentences in the foreign language.
6.	Narrate on how the foreign language functions with awareness and understanding of the language culture.	6.	Achieve institute's mission with respect to global education and foreign language education.

Curriculum Content	**Hours**
Unit I: General Information on Basic Grammar of the foreign language, Introduction to alphabets.	05
Unit II: Gender of Noun, Number of Noun, Pronouns, Adjectives, Verbs and their usage in simple sentences, Numbers (up to 10), Simple Greetings in foreign language.	05
Unit III: General Questions in foreign language, like What is your name/surname? Who/What is this? etc.	04
Unit IV: Simple narration about self/family/friend/University in foreign language chosen for studies. Practicing the learnt topics in the class itself.	05

Unit V: Formation of simple sentences using Parts of Speech, Information on Cases, One or Two simple lessons from any book.		05
Unit VI: Basic information on Country and Culture of language under study.		04
Suggested Reference Books:		
1.	V.N.Wagner and V. G. Ovsienko, "Russian Language", Russian, People's Publishing House, New Delhi.	
2.	S. Khavronina and A. Shirochenskaya, "Russian in Exercises", 1991.	
3.	"Genki – Japan Times".	
4.	Osamu and Nobuko Mizutani, "Aural Comprehension in Japanese".	
5.	Osamu and Nobuko Mizutani, "An Introduction to Modern Japanese".	
6.	Y. Yoshida, "Japanese for Today".	
7.	Ed Swick, "The Everything Learning German Book: Speak, Write and Understand Basic German in No Time".	
8.	Ed Swick, "Living German".	
9.	Eugene Jackson and Adolph Geiger, "German Made Simple: Learn to Speak and Understand German Quickly and Easily".	
10.	Professor Martin Durrell, "Hammer's German Grammar and Usage" (Fifth Edition).	

Class, Part and Semester	:	Third Year B. Tech (Civil Engineering), Part II, Semester VI				
Course Title	:	Theory of Structures-II		*Course Code*	:	CE 321
Teaching Scheme (Hours)	:	Lecture	04Hours/Week	*Total Credits*	:	05
		Tutorial	01 Hours/Week			
Evaluation Scheme (Marks)	:	CIE=30 (20+10) IOE=50	SEE = 70	Grand Total =100	*Duration of SEE*	:	03 Hrs.
Revision	:	Second		*Month*	:	June 2022
Pre-requisites (If any)	:	ES-11A2, ES-12B2, CE212, CE221				
Course Domain	:	Core				

Course Rationale:

Course Objectives: The Course Teacher will		*Course Outcomes:* Students will be able to	
1.	To understand application of displacement methods for the analysis of indeterminate structures	1.	Analyze indeterminate structures using displacement methods.
2.	To learn the concepts and use of matrix method in structural analysis	2.	Analyze indeterminate structures using Flexibility and Stiffness Method.
3.	To understand structural behavior of three and two hinged arches and use of ILD for determinate and indeterminate structure	3.	Analyze three and two hinged arches and develop Influence Line Diagram for determinate and indeterminate structures
4.	To understand approximate methods of analysis for multistoried rigid jointed frames	4.	Compute internal forces developed in multistoried rigid jointed frames using approximate method of analysis.
5.	To analyze structures using softwares.	5.	Analyze structures using commercial softwares.

Curriculum Content	Hours
Unit I Analysis of indeterminate Structures by Displacement Methods A) Slope deflection method B) Moment distribution method Applications to continuous beams, sway and non-sway frames	10
Unit II Flexibility method of analysis: Formulation of flexibility matrix. A) Application to beams and rigid jointed rectangular plane frames, Settlement and rotation of supports. B) Application to pin jointed Plane trusses	10

Unit III Stiffness method of analysis: Formulation of stiffness matrix A) Application to beams and rigid jointed rectangular plane frames, Settlement and rotation of supports. B) Application to pin jointed Plane trusses	9
Unit IV Arches-Three hinged and two hinged arches. Parabolic and Semi-Circular arches. Influence lines for statically determinate and indeterminate structures	11
Unit V Approximate methods of analysis of multi-storied, multi-bay rigid jointed frames. (i) Portal frame method (ii) Cantilever method (iii) Substitute frame method	7
Unit VI Analysis of Structures using at least one commercial software such as STAAD.Pro, ETABS, SAP etc.	5

	Suggested Text Books:
1.	S.S.Bhavikatti, "Structural Analysis" , Vol.I and Vol.II, New Age Publisher
2.	Reddy C. S., "Basic Structural Analysis", Tata McGraw Hill Publication Company Ltd.,
3.	T.S.Thandavmoorthy, "Structural Analysis", Oxford Publication
4.	Vazirani and Ratwani, "Analysis of Structures (Vol. I and II)", Khanna Publication, Delhi

	Suggested Reference Books:
1.	Gere and Weaver,"Matrix Analysis of Structures", Second Edition, CBS Publishers, New Delhi
2.	Hibbeler R.C., "Structural Analysis", 9th Edition, Pearson Education India
3.	Devdas Menon "Structural Analysis", Narosa Publication
4.	Devdas Menon "Advanced Structural Analysis", Narosa Publication
5.	Pandit-Gupta, "Structural Analysis A Matrix Approach", Tata McGraw Hill Publication
6.	Wang C. K., "Indeterminate Structural Analysis", Tata McGraw-Hill Publishing Company

Class, Part and Semester	:	Third Year B. Tech (Civil Engineering), Part II, Semester VI				
Course Title	:	Water Resources Engineering-I		*Course Code*	:	CE 322
Teaching Scheme (Hours)	:	Lecture	04Hours/Week	*Total Credits*	:	04+00= 04
		Tutorial	00 Hours/Week			
Evaluation Scheme (Marks)	:	CIE=30 (20+10)	SEE = 70 | Grand Total =100	*Duration of SEE*	:	03 Hrs.
Revision	:	Second		*Month*	:	June 2022
Pre-requisites (If any)	:	Mathematics, Engineering Mechanics, Fluid Mechanics				
Course Domain	:	Core				

Course Rationale: Impart the basic knowledge of importance of Hydrology and irrigation in water resources development.

Course Objectives: The Course Teacher will to		*Course Outcomes:* Students will be able to	
1.	Impart the basic knowledge of importance of Hydrology and irrigation in water resources development.	1.	Apply the knowledge of estimation of hydro meteorological parameters.
2.	Know various hydro meteorological parameters and their estimation.	2.	Design of efficient hydraulic structures.
3.	Create awareness about floods, their estimation using various methods.	3.	To develop different methods of efficient irrigation and water conservation
4.	Understand the importance of irrigation in Indian. Agricultural industry considering cropping patterns.	4.	To develop the methods of consumptive use of surface water and groundwater.

Curriculum Content	Hours
Unit I **Introduction of Hydrology:** Definition, Importance and scope of hydrology, hydrological cycle. **Precipitation:** Forms and types of precipitation, Methods of measurement, Graphical representation of rainfall – Mass, rainfall curves, Hyetograph. Determination of average precipitation over the catchment. **Evaporation:** Process, factors affecting, measurement and control of evaporation. Evapo-transpiration, watershed **Infiltration:**	10

Process, Factors affecting and measurement of Infiltration	
Unit II **Runoff:** Factors affecting runoff, Determination of annual runoff, Rainfall runoff relationship. **Hydrograph:** Storm hydrograph, Base flow and Separation of base flow, direct runoff hydrograph, Unit hydrograph – theory – assumptions and limitations. Hydrograph analysis- Derivation and use of unit hydrograph, S-curve hydrograph. Reservoir capacity, Reservoir planning and sediment control.	08
Unit III **Stream gauging:** Selection of site, discharge measurement by Area velocity method, slope Area method. **Floods:** Estimation of peak flow- empirical equations, rational method, Importance of Design flood, standard project flood, flood routing, maximum probable flood, Introduction to flood frequency analysis.	08
Unit IV **Ground water hydrology:** Occurrence, distribution and classification of ground water, Darcy's law, Aquifer parameters, Permeability, specific yield, specific retention, porosity, storage coefficient, Transmissibility. Hydraulics of well under steady flow conditions in confined and unconfined aquifers, Specific capacity of well, Recuperation Test, constructional features of Tube wells and Open wells.	08
Unit V **Introduction to irrigation:** Definition and necessity of irrigation, ill-effects of irrigation, Surface, Sub-surface, Sprinkler irrigation, Drip Irrigation, Water logging and land drainage. Gravity Dams and spillways: lined and unlined canals, design of weirs on permeable foundation: cross drainage structures. **Water requirement of crops:** Principal crops and crop seasons, cropping pattern and crop rotation, Classes and availability of soil water, depth and frequency of irrigation, Duty, Delta, Base Period and their relationship, factors affecting duty, methods of improving duty. Assessment and efficiency of irrigation water.	10

Gross Command Area, Culturable Command Area and command area calculations based on crop water requirement. Estimation of evapo-transpiration by blaney-criddle method and penman method.	
Unit VI **Minor Irrigation Works:** General layout, main components and functioning of - 1. Percolation Tank, 2. K.T.Weir, 3. Bandhara irrigation 4. Lift irrigation 5.Drip irrigation **Watershed Management:** Need and importance of watershed management, Soil conservation measures, Techniques of Rainwater and groundwater harvesting.	08

Suggested Text Books:	
1.	Garg. S. K., "Irrigation Engineering",Khanna Publishers, Delhi.
2.	Dr Punmia and Dr.Pande ,"Irrigation and Water Power Engineering", Laxmi Publications,Delhi
3.	Dr. Subramanya. K., "Engineering Hydrology"., Tata McGraw Hill, New Delhi.
4.	Dr Modi. P.N. , "Irrigation, Water Resources and Water Power Engineering"
Suggested Reference Books:	
1.	Varshney, Gupta and Gupta, "Theory and design of irrigation", structures vol. I and II and III,
2.	Ghanshyam Das., "Water and Soil Conservation".
3.	R.K.Sharma, "Hydrology and water resources", Dhanpatrai and sons, New Delhi.
4.	"Design of M.I. and Canal Structure", Satyanarayan and R. Murthy.
5.	Michael, "Irrigation Theory and practice", Vikas Publications House.

Class, Part and Semester	:	Third Year B. Tech (Civil Engineering), Part II, Semester VI					
Course Title	:	Transportation Engineering-II			*Course Code*	:	CE 323
Teaching Scheme (Hours)	:	Lecture	04Hours/Week		*Total Credits*	:	04+00 = 04
		Tutorial	00 Hours/Week				
Evaluation Scheme (Marks)	:	CIE=30 (20+10)	SEE = 70	Grand Total =100	*Duration of SEE*	:	03 Hrs.
Revision	:	Second			*Month*	:	June 2022
Pre-requisites (If any)	:	Geotechnical Engineering.					
Course Domain	:	Core					

Course Rationale: This course is to possess the fundamental knowledge of railway engineering , Tunneling and Docks and harbors.

Course Objectives: The Course Teacher will		*Course Outcomes:* Students will be able to	
1.	To familiarize students with sub-branches of Transportation Engineering such as railway engineering, tunnel engineering, dock and harbour engineering.	1.	Apply basics of railway engineering, its components and geometric design.
2.	To make students learn various terminologies related with railway engineering, tunnel engineering, dock and harbour engineering.	2.	Signalling and interlocking in railway engineering, construction and maintenance of railway track and modern trends in railways.
3.	To study the various components involved in railway engineering, tunnel engineering, dock and harbour engineering.	3.	To Understand principles and basics of tunnel engineering.
4.	To understand the planning aspect involved in railway engineering, tunnel engineering, dock and harbour engineering.	4.	To Understand principles and basics of dock and harbor engineering.

Curriculum Content	Hours
RAILWAY ENGINEERING **Unit I** a) Introduction, History , Organizational structure of Indian railways, railway lines classification based on speeds , Modernization in Railways and railway tracks, High speed rail tracks, metro rail, bullet train, hyper loop train concept. b) Permanent Way: Types of rail sections, Components, coning of wheels. Rail creep, Rail	

defects, Rail joints, welding of rails, short welded rail (SWR), long welded rail (LWR) and continuously welded rail (CWR), sleepers requirement, Sleeper density, spacing, and types, Rail fittings, Elastic fastenings, bearing plates, anti-creep devices, check and guard rails, Ballast requirements and specification, Formation, Different C/s of Track in cutting and embankment, suitability of drainage.	12
Unit II a) Geometric design: Alignment, gradient, horizontal curves, Grade Compensation on curves super elevation, design problems on above. Speed on curves, safe speed on curves using Indian railway formula only for fully transitioned curves. Gauge widening. Points, crossing and turnouts b) Points and Crossing: Terms used, standard points and crossings, design of simple turnout various types of track junctions. c) Stations and yards: purpose, location, site selection, types and general layouts of terminus, Junction. d) Signaling and interlocking-Introduction, Construction and maintenance of railway track: methods, material required per KM of track, tools and plant used for plate laying, maintenance of Track, Modern trends in railways. Visit to railway station.	14
TUNNELING **Unit III** a) Introduction, Advantages and disadvantages of tunnel with respect to open cuts, Tunnel surveying, Surface surveys, Transferring centerline, Setting out and Transfer of Levels. Underground. Criteria for Selection of size and shape of tunnels, Factors affecting the methods of Tunneling. Geological investigation for tunnels and its importance, tunnel alignment, tunnel shafts, pilot tunnels. b) Tunneling in hard rock, (TBM). c) Tunneling in soft materials: shield methods. Tunnel lining (rock bolting and guniting), Safety measures, ventilation, lighting and drainage of tunnels	8
Unit IV Driving tunnels in hard ground Sequence of operation and typical distribution of time for each operations, Meaning of the term 'Faces of Attack', Drill blast method of tunneling for hard strata, Different patterns of drilling. Blasting and explosives Meaning of the terms, types of explosives,	8

method of blasting in brief. Dust control, Ventilation Meaning of the term, requirements a ventilating system, Methods of ventilation with advantages and disadvantages. Lighting and aspects of drainage in brief. Method of supporting roof consisting of shot creating. Cement grouting, rock bolting, Cast in-situ and precast lining.	
DOCK AND HARBOUR ENGINEERING **Unit V** a) Introduction, Definition, Requirements, classification of harbors with examples, Factors affecting growth of port, Major Ports in India and abroad, Planning a Port, Selection of ideal location of harbor, Introduction to dredging. Inland water transport in India, tides, waves, erosion, beach drift, littoral drift sand bars, coast protection, classification of ports and harbors, sites selection, break waters, jetties, wharves, piers, facilities required. b) Types of dock, navigational aids, lighthouses, terminal buildings special equipment, Containerization.	5
Unit VI Breakwater and materials of construction for breakwater, Introduction to design of break waters, Dock, Bulkhead and Sea Walls, Design Considerations and Construction Materials, Revetments, Water front structures, Wharves, Jetty, Dolphins, Different types of dock fenders, Uses of wet docks and Dry/ Repair docks. Port facilities, Transit sheds and warehouses. Visit to dock, harbor or port.	5

Suggested Text Books:	
1.	Saxena and Bindra, "Principals of Railway Engineering", Dhanpat Rai and Sons.
2.	Saxena and Bindra, "Tunnel, Bridge and Railway Engineering", Dhanpat Rai and Sons.
3.	Oza Chartor, "Dock and Harbor Engineering", Publication House.
Suggested Reference Books:	
1.	Mundrey J.S., "Railways Track Engineering', Tata Mcgraw Hill, New Delhi.
2.	Vazirani V.N. and Chandola S.P., "Transportation Engineering Volume 1".
3.	Saxena S.C., Arora, "A Textbook of Railway Engineering", Dhanpat Rai and Sons, Delhi.
4.	Murthy G. V., "Tunnels and Elements of Docks and Harbours".

5.	Rangwala S. C., "Principles of Railway Engineering", CBS Publishers, 1965, 2nd Edition.
6.	Megaw T. M. and Bartlett J., "Tunnels Planning, Design, Construction", EHJW, 1983,
7.	Saxena S. C., "Tunnel Engineering", Dhanpat Rai and Sons, 1984, 1st Edition.
8.	Saxena Subhash C., "Tunnel Engineering", Dhanpat Rai and Sons, New Delhi.
9.	Bindra S. P., "Dock and Harbour Engineering", Dhanpat Rai Publications, 1979, 1st Edition.
10.	Shrinivasan- Chartor, "Dock, Harbor and Tunnel Engineering", Pub. House.
11.	US Army Corps of Engineers, "Coaster Engineering Manuals", Volume I and II, Vicksburg.
12.	Quinn, "Planning and construction of Docks and Harbours", Tata McGraw Hill.

Class, Part and Semester	:	Third Year B. Tech (Civil Engineering),Part II, Semester VI			
Course Title	:	Environmental Engineering II	Course Code	:	CE324
Teaching Scheme (Hours)	:	Lecture 04Hours/Week Tutorial 00 Hours/Week	Total Credits	:	04
Evaluation Scheme (Marks)	:	CIE=30 (20+10)	SEE = 70 Grand Total =100	Duration of SEE	: 03 Hrs.
Revision	:	Second	Month	:	June 2022
Pre-requisites (If any)	:	Chemistry, Basic Civil Engineering			
Course Domain	:	Core			

Course Rationale: The course has prime importance to acquit knowledge of solid waste management and waste water treatment.

Course Objectives: The Course Teacher will		Course Outcomes: Students will be able to	
1.	To describe wastewater , its sources, characteristics and collection system	1.	Explain sources, characteristics and collection system of wastewater.
2.	To design the various treatment processes for waste water treatment.	2.	Design the various treatment processes for wastewater treatment.
3.	To study different operational problems and their remedies.	3.	Apply the knowledge to solve different operational problems and their remedies
4.	To explain various aspects of solid waste management.	4.	Understand importance of solid waste Management.
5.	To outline the effects of air pollution and its control measures.	5.	Describe the effects of air pollution and its control measures.

Curriculum Content	Hours
Unit I Introduction Objective, Basic design considerations like Engineering, Environmental Process, flow diagrams, Design Period. Characteristics of wastewater: Physical, Chemical and Biological characteristics, Wastewater sampling and analysis, and Practical Significance of test results. River Sanitation Self-purification of natural streams, Stream standards, effluents Standards, Oxygen Sag Curve. Pollution. Noise Pollution-Soures, effects and Control.	**08**
Unit II Sewerage Flow Sources of sewage, Variations in sewage flow, storm-water runoff, ground water infiltration. Design of sanitary sewers, Minimum size of sewer, velocities in sewers and gradient of sewers.	**09**

Sewer appurtenances i.e. manholes, street inlets, flushing devices, Vent pipes etc. Pumping of sewage, types of pumps for sewage pumping.	
Unit III Wastewater Treatment Theory and design of primary treatment UNITs. Screens: Types of screens, design of screen chamber, disposal of Screenings. Grit Chamber: Sources of grit, velocity control in grit chamber, design of grit chambers including proportional flow weir, disposal of grit, Sources of oil and grease, importance of removal, methods of oil and grease removal, design of Skimming tanks. Primary Sedimentation: Necessity, design of PST with inlet and outlet details, Primary Sludge and its disposal.	**09**
Unit IV Theory and Design of Aerobic Secondary Treatment UNITs Activated sludge Process: Biological principle, modification of ASP, sludge volume index, sludge bulking and control. Trickling filter: Biological principle, different T.F. And their characteristics, Deign of standard rate or High rate filters, single stage and two stage filters, Recirculation, Ventilation, Operational problems, Control measure, Rotating Biological Contactor. Theory and Design of Anaerobic Treatment Units Septic tanks, suitable conditions and situations, biological Principle, method of treatment and disposal of septic tank effluent	**09**
Unit V Solid Waste Management : Definition, types, sources, characteristics. Functional outline, Generation, Storage, Collection, Processing techniques. Methods of treatment, Composting, Incineration, Pyrolysis, Sanitary land filling, Concept of Hazardous waste management.	**08**
Unit VI Emerging Technologies for Waste Water Treatment Centralized sewage treatment systems, Consequences of centralized wastewater treatment, Objectives of small and decentralized wastewater treatment systems Advantages of Decentralized Wastewater Treatment, Applications of decentralized wastewater management to: a) Root zone Technology Principle, types of plants used, advantages, disadvantages b) Constructed wastelands process description, advantages and disadvantages c) Duckweed ponds process description, advantages and disadvantages d) Fluidized aerobic bed technology Principle, process description, advantages Disadvantages e) Up flow sludge Blanket Reactors (UASBR) - Principle, design, advantages and disadvantages	**09**
Suggested Reference Books:	
1.	Bhide, A.D., and Sunderasen B.B., "Solid Waste Management in Developing Countries", Indian

	National Scientific Documentation Centre, New Delhi, 1998.
2.	Canter, "Environmental Impact Assessment", TMH Publication, 2000.
3.	Hammer and Hammer, "Water and Wastewater Technology", Prentice Hall Publication, 2008
4.	Garg S. K, "Sewage Disposal and Air Pollution Engineering", Khanna Publishers, 2000.
5.	Garg S.K., "Wastewater Engineering", Khanna publication, 2000
6.	Gray N. F., "Water Technology", Butterworth-Heinamann, 2002
7.	Masters G. M., "Introduction to Environmental Engineering and Science", 2004.
8.	Metcalf and Eddy, "Waste Water Engineering Treatment and Disposal", Tata Mc-Graw-Hill Publication, 2003.
9.	Peavy H. S., Rowe D. R., and Tchobanoglous, "Environmental Engineering", McGraw-Hill Book Company, 1985.
10.	Rao M.N. and Rao H.V.N., "Air Pollution", Tata McGraw Hill, 2006.
11.	Rao P. V., "Environmental Engineering – II", Tata McGraw Hill Publication, 2003
12.	Soli J. Arceivala, "Wastewater Treatment For Pollution Control", 1999
13.	Manual on Municipal Solid Waste and Management", Government of India Publication, 2000.
14.	Viessman W. and Hammer M. J, "Water Supply and Pollution Control", Harper Collins College Publishers, 1993.

Class, Part and Semester	:	Third Year B. Tech (Civil Engineering), Part II, Semester VI				
Course Title	:	Geotechnical Engineering-II		Course Code	:	CE 325
Teaching Scheme (Hours)	:	Lecture	03Hours/Week	Total Credits	:	3+1=04
		Tutorial	01 Hours/Week			
Evaluation Scheme (Marks)	:	CIE=30 (20+10)	SEE = 70	Grand Total =100	Duration of SEE	:	03 Hrs.
Revision	:	Second		Month	:	June 2022
Pre-requisites (If any)	:	Basic Civil Engineering ,Building Construction material				
Course Domain	:	Core				

Course Rationale: Geotechnical Engineering forms a core subject, taught to all students of the civil engineering. The study of this course is aimed at developing a thorough practical understanding of the basic of soil exploration and types of foundation and its design through simple experiments on different soil sample.

Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1	To provide students necessary knowledge and skill required for interpretation of bearing capacity and settlement of foundations	1	Explain the suitability of different soil exploration methods and various types of foundations.
2	To introduce students the process of soil compaction and consolidation with field control and application.	2	Demonstrate the understanding of basic information about modern foundation and ground improvement techniques.
3	To provide students knowledge and skills required to design shallow and pile foundation.	3	Analyze types of foundation and its stability
4	To provide students knowledge Well Foundations, Coffer Dam and Ground Improvement Techniques.	4	Estimate the bearing capacity and settlement of foundation for different soils as per IS standards.

Curriculum Content	Hours
Unit I Soil and Rock Exploration Necessity, Planning, No and depth of bore holes, Exploration methods - auger boring (hand and continuous flight augers), and wash boring, rotary drilling, percussion drilling. Soil sampling - Disturbed and undisturbed, Rock drilling and sampling, Types of sampler. Mechanical properties of rock, Behavior of rocks in uniaxial compression, Tensile strength of rocks Types of rock failure, Core barrels, Core boxes, Core recovery, Rock quality designation	06
Unit II Bearing Capacity Evaluation Definitions, Modes of failure, Terzaghi's bearing capacity theory, Meyerhof's bearing capacity, I.S. Code method of bearing capacity evaluation and computation (IS 6403) Effect of various factors on bearing capacity (Size and Shape, Depth, WT) Bearing capacity evaluation from Plate Load Test, S.P.T. (By I.S. Code method), Static cone penetration test and Menards pressure meter tests with detailed procedure.	07
Unit III Shallow Foundation and Foundation Settlement Types and their selection, Minimum depth of footing, Assumptions and limitations of rigid design	06

analysis. Design of isolated, combined, strap footing (Rigid analysis), raft foundation (elastic analysis), floating foundations (R.C.C. Design is not expected) Immediate settlement - computations from I.S. 8009 - 1976 (Part I) approach, Consolidation Settlement computations, Concept of total settlement, Differential settlement and angular distortion.	
Unit IV Pile Foundation Classification and their uses, Single pile capacity evaluation by static and dynamic methods for cohesive and cohesion less soil, Pile load test. Negative skin friction Group action piles, Spacing of piles in group, Group efficiency. Under reamed piles - equipment, construction and precautions.	07
Unit V Analysis of Slope Stability Slope classification, Slope failure, Modes of failure. Infinite slope in cohesive and cohesion less soil Taylor's stability number, Swedish slip method, Method of slices and concept of friction circle method, Landslide.	07
Unit VI **Well Foundations, Coffer Dam and Ground Improvement Techniques** Element of wells, Types, Methods of construction, Tilt and shift, Remedial measures. Pneumatic Caissons: Sinking method - Sand island method, Caisson disease. Types and material used for sheet piling Common types of cofferdams, Braced cofferdam. Stone columns, Vibro-flotation, Preloading technique, Civil engineering application of geo synthetics, Geo textile and geo membrane	06
Suggested Text Books:	

1. "Soil Mechanics in Engineering Practice" - Karl Terzaghi, Ralph B. Peck and Gholamreza Mesri, Wiley India Pvt. Ltd
    2. "Basic and Applied Soil Mechanics" - Gopal Ranjan and A S Rao, G. K. Publications Pvt. Ltd.
    3. "Soil Mechanics and Foundation Engineering" - V. N. S. Murthy, B. S. Publications (3rd Edition)
    4. "Soil Mechanics and Foundation Engineering" - B. C. Punmia, Laxmi Publishing Co., New Delhi.
    5. "Geotechnical Engineering" - Dr. B. J. Kasmalkar, Pune Vidyarthi Griha Prakashan.	

Suggested Reference Books:	

1. "Foundation Analysis and Design" - Joseph E Bowles, McGraw Hill Publications
 	
    2. "Soil Mechanics" - Lambe and Whitman, S. Chand Publications (SI Version).
 	
    3. "Geotechnical Engineering" – Prentice Hall, Delhi by Iqbal H Khan	

Class, Part and Semester	:	Third Year B. Tech (Civil Engineering), Part II, Semester VI				
Course Title	:	Lab-II Geotechnical Engineering -II		*Course Code*	:	CE 326
Teaching Scheme (Hours)	:	Practical	2Hours/Week	*Total Credits*	:	01
Evaluation Scheme (Marks)	:	IOE = 0	EOE =50	Grand Total = 50	*Duration of EPE*	:	02Hrs.
Revision	:	Second		*Month*	:	June 2022
Pre-requisites (If any)	:	Basic Civil Engineering.				
Course Domain	:	Core				

Course Rationale: Geotechnical Engineering forms a core subject, taught to all students of the civil engineering. The study of this course is aimed at developing a thorough practical understanding of the basic of soil exploration and types of foundation and its design through simple experiments on different soil sample.

Course Objectives: The Course Teacher will		*Course Outcomes:* Students will be able to	
1.	To introduce students the process of soil exploration in different soil and rock strata as well as different ground improvement techniques.	1.	Demonstrate the experiments exploration in different soil.
2.	To provide students necessary knowledge and skill required for interpretation of bearing capacity and settlement of foundations	2.	To calculate bearing capacity and settlement of foundations.
3.	To introduce students the process of soil stability , cofferdams and its application.	3.	To find stability of slopes and apply knowledge of cofferdams
4.	To provide students knowledge and skills required to design shallow and pile foundation	4.	Design shallow and pile foundation.

General Instructions:

The laboratory work should include the following:
Term work:
I) List of experiments:
1. Determine the bearing capacity of soil by using plate load test.
2. Determination of standard penetration Test.
3. Determination of consolidation Settlement of soil.
4. Demonstration on soil sampling.
II) A) Design Problem-
1. Bearing capacity calculation by various method and settlement calculations
2. Design of shallow foundation
3. Pile and Pile group
4. Raft Foundation
5. Stability analysis of slopes
III) Industrial visit

1. Visit to Earthwork site	
Suggested Text Books/ Reference Books/Manual	
	1. Foundation Engineering by B.J. Kasamalkar 2. Soil Mechanics and Foundation Engg. by V.N.S.Murthy 3. Soil Mechanics and Foundation Engg. By K.R.Arora 4. Soil Mechanics and Foundation Engg. by B.C. Punmia 5. Foundation Engineering by S.P.Brahma 6. Basic and applied soil mechanics - New age publication, Delhi by Gopal Ranjan, Rao ASR.

Class, Part and Semester	:	Third Year B. Tech (Civil Engineering), Part II, Semester VI			
Course Title	:	Lab-II Environmental Engineering-II	*Course Code*	:	**CE 327**
Teaching Scheme (Hours)	:	Practical	2Hours/Week	*Total Credits*	:	01
Evaluation Scheme (Marks)	:	IOE Nil	EPE =50	Grand Total =50	*Duration of EPE*	:	02Hrs.
Revision	:	Second		*Month*	:	June 2022
Pre-requisites (If any)	:	Chemistry				
Course Domain	:	Core				

Course Rationale: The course has prime importance to acquit knowledge of solid waste management and waste water treatment.

Course Objectives: The Course Teacher will		*Course Outcomes:* Students will be able to	
1.	To describe wastewater , its sources, characteristics and collection system	1.	Explain sources, characteristics and collection system of wastewater.
2.	To design the various treatment processes for waste water treatment.	2.	Design the various treatment processes for wastewater treatment.

A, B and C are compulsory

A.

General Instructions: Any 8 experiments to be performed from the list, any 2 experiments to be studied as demonstration.

Sr. No.	List of Experiments
1.	pH
2.	Dissolved Oxygen
3.	Biochemical Oxygen Demand
4.	Chemical Oxygen Demand
5.	Different Forms of Solids Content
6.	Sludge Volume Index
7.	Conductivity and Dissolved Salt Concentration
8.	MPN
9.	Measurement of calorific value of solid waste
B	Site visit to wastewater treatment plant: A report based on the visit to water treatment plant would be submitted and would form a part of the term work.
C	Preparation of DPR for Solid and liquid Waste Water Management for a Village using relevant software's.

Class, Part and Semester	:	Third Year B. Tech (Civil Engineering), Part II, Semester VI				
Course Title	:	Lab-III Structural Design and Drawing - I	Course Code	:	CE 328	
Teaching Scheme (Hours)	:	Practical	2Hours/Week	Total Credits	:	01
Evaluation Scheme (Marks)	:	IOE = 50	EPE =50	Grand Total = 100	Duration of EPE	:	02Hrs.
Revision	:	Second			Month	:	June 2022
Pre-requisites (If any)	:	CE212, CE221, CE311				
Course Domain	:	Core				

Course Rationale: The course aims at imparting knowledge and skill of all the necessary components such as material specifications, connections, analysis and elementary design of structural members for designing the industrial steel structures and preparation of drawings.

Course Objectives: The Course Teacher will		Course Outcomes: Students will be able to	
1.	To make the students familiar with the relevant BIS codes to be used in design of steel structures.	1.	Understand the use of IS Codes related to structural design of steel structures
2.	Demonstrate the determination of loads on steel structure	2.	Calculate loads on steel structure
3.	Illustrate the analysis of the steel structure	3.	Analyze the steel structure
4.	Explain the design of steel structures	4.	Design complicated structures like plate girder, gantry girder, Industrial structures
5.	Guide to prepare detailed structural drawings of a steel structure	5.	Prepare detailed structural drawings of a steel structure

General Instructions:

Sr. No.	List of Experiments
	The laboratory work should include the following:
1	Design of any **ONE** structure as per IS: 800- 2007 a) Industrial building with roof supported by steel trusses. b) Pedestrian bridge c) Design of Pre Engineered Building
2	Design of any **ONE** structure a) Design of continuous beams using plastic analysis as per SP:6 b) Design of plate girder (welded) c) Design of Gantry Girder

3	The Report should include
	Brief Technical design project report involving Introduction, assumptions, load calculations, analysis, preferably using suitable software such as STAAD.Pro, ETABS, etc. and detailed design.
4	Drawings
	Structural plan and detailed structural drawings (using software) of the designed structure.
5	Report of a site visit mentioning structural details with relevant sketches of structural connections.

Suggested Text Books/ Reference Books/Manual	
1.	Duggal S. K., "Design of Steel Structures", Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 2008, 3rd Edition.
2.	Ram Chandra, "Design of Steel Structures, Vol - I and Vol – II", Standard Book House, New Delhi, 2007, 2nd Edition.

Reference Codes:	
1.	IS: 800-2007, Indian Standard code of Practice for use of structural steel in general building construction, BIS – New Delhi (Third Revision).
2.	IS: 875 (Part 1) (1987, Reaffirmed 2008): Code of Practice for Design Loads (Other than Earthquake) For Buildings and Structures. Part 1: Dead Loads - Unit Weights of Building Materials and Stored Materials (Second Revision).
3.	IS: 875 (Part 2) (1987, Reaffirmed 2008): Code of Practice for Design Loads (Other than Earthquake) For Buildings and Structures. Part 2: Imposed Loads (Second Revision).
4.	IS: 875 (Part 3) (2015): Code of Practice for Design Loads (Other than Earthquake) For Buildings and Structures. Part 3: Wind Loads (Third Revision).
5.	IS Handbook No. 1- Properties of structural Steel Rolled Section.
6.	Steel Table

Class, Part and Semester	:	Third Year B. Tech (Civil Engineering), Part II, Semester VI				
Course Title	:	**Mini Project**		*Course Code*	:	CE 329
Teaching Scheme (Hours)	:		2hrs	*Total Credits*	:	01
Evaluation Scheme (Marks)	:	IPE=50	EOE ---	Grand Total =50	*Duration of IOE*	:	02Hrs.
Revision	:	Second			*Month*	:	June 2022
Pre-requisites (If any)	:	The pre-requisite for this course is to have the idea of the overview of the fundamental courses of Civil Engineering .				
Course Domain	:	Core				

Course Rationale: To make necessary preparatory actions for development and investment projects or to undertake surveys or pre-feasibility studies to justify activities within larger projects.

Course Objectives: The Course Teacher will		*Course Outcomes:* Students will be able to	
1.	Describe the —Product Development Process including budgeting through Mini Project.	1.	Understand, plan and execute a Mini Project with team
2.	Plan for various activities of the project and distribute the work amongst team members.	2.	Understand importance of team work.
3.	develop student's abilities to transmit technical information clearly and test the same by delivery of Seminar based on the Mini Project.	3.	Prepare a technical report based on the Mini project.
4.	Describe importance of document design by compiling Technical Report on the Mini Project work carried out.	4.	Deliver technical seminar based on the Mini Project work carried out

Course Description:
The course introduces a project, based on a problem based learning approach, guided by realistic and challenging customer requirements. The project course is organized as group work. Based on an idea, the students shall deliver a requirement and design specification of the system to be developed. The system, that consist of an already existing hardware and software platform shall be controlled by software.

The students shall implement the software part based on the design, test and demonstrate the results. In this course the students learn to analyze the demands of a customer, capture these in a software requirements specification including quality requirements, and to design and develop software from this analysis. The students train their skills in requirements analysis, software design, quality analysis, programming, and testing.

During the work the students will utilize modern techniques, methods and approaches for system and software development and project management. The system aspects integrated in the software implementation will be in the focus of the project.

Class, Part and Semester	:	Third Year B. Tech (Civil Engineering), Part II, Semester VI					
Course Title	:	Research Methodology			Course Code	:	AC 321
Teaching Scheme (Hours)	:	2 hr. /week= 2 x 14= 28 hours			Total Credits	:	Nil
Evaluation Scheme (Marks)	:	Assignments : 50 Viva-voce : 25		Written Test : 25 Grand Total : 100	Duration of SEE	:	Not Applicable
Revision	:	Second			Month	:	June 2022
Pre-requisites (If any)	:	No					
Course Domain	:	Research Skills					

Course Rationale: Having studied this course, the researchers can formulate the path to be used in conducting any research and reporting its findings. The course helps in the search of literature, development of research questions and the creation of the most suitable study design. In a way research methodology is the constitution for research.

Course Assessment Methods: The students will be given five assignments each for 10 marks. At the end of the course, there will be a written test of 25 marks and a viva voce of 25 marks. There will be assessment for a total of 100 marks. Based on the marks obtained, they will be awarded with a grade similar to other credit courses. Though it is an audit course, obtaining passing grade is essential.

Course Objectives: The Course Teacher will		*Course Outcomes:* Students will be able to	
1.	Introduce research phenomenon and its key components to the students;	1.	Understand some basic concepts of research and its methodologies;
2.	Discuss the role and importance of research in the engineering sciences;	2.	Explain key research concepts and issues;
3.	Identify and discuss the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project;	3.	Read, comprehend, and explain research articles in their academic discipline;
4.	Help identify various sources of information for literature review and data collection;	4.	Select and define appropriate research problem and parameters;
5.	Identify and discuss the concepts and procedures of sampling, data collection, analysis and reporting;	5.	Follow research procedures of sampling, data collection, analysis and finally reporting of research work;

Curriculum Content	Hours
Unit I: Introduction to Research: Definition and basic Types of research, Research process and steps in it, Concept of Hypothesis, Research proposals and aspects.	03
Unit II: Basic Statistics required for any research: Introduction to Descriptive Statistics, Statistical data, Variable, Classification of data, exploratory data analysis, Measures of central tendency, Dispersion-Standard deviation, Correlation and regression analysis.	06
Unit III: Introduction to Design of Experiment: Concept of design of experiment, its objectives, strategies, Factorial experimental design, designing engineering experiments, basic principles, of replication. Guidelines of experiments.	06
Unit IV: Single Factor Experiment: Hypothesis testing, Analysis of Variance components (ANOVA) for fixed effect model; Total, treatment and error of squares, Degrees of freedom, Confidence interval; ANOVA for random effects model, Estimation of variance components, goodness of fit tests, Chi-Square test, Kolmogorov-	06

Smirnov(K-S) test.		
Unit V: Two factor Factorial Design: Basic definitions and principles, main effect and interaction, response surface and contour plots, General arrangement for a two-factor factorial design; Models-Effects, means and regression, Hypothesis testing.		07
Suggested Reference Books:		
1.	Kothari, C.R., Research Methodology –Methods and techniques, New Age Publications, New Delhi, 2009.	
2.	Montgomery, Douglas C. (2007), 5/e, Design and Analysis of Experiments, Wiley India.	
3.	Montgomery, Douglas C. and Runger, George C. (2007), 3/e, Applied Statistics and Probability for Engineers, Wiley India.	
4.	J. Medhi, Statistics Methods, New Age Publications, New Delhi 2009.	
5.	Nabendu Pal and Saheb Sarkar, Statistics: Concepts and Applications, Prentice Hall of India Pvt. Ltd. New Delhi, 2004.	
6.	Panneerselvam, R., Research Methodology, Prentice-Hall of India, New Delhi, 2004	

Equivalence of Third Year B.Tech (Civil Engineering) Semester V and VI

The above syllabus structure is a revised version of the Third Year B.Tech (*Civil Engineeng*) Program being conducted by Shivaji University at its Technology Department. This syllabus is to be implemented from June 2022, (Academic year 2022-23).

The Equivalence for the subjects/courses of *Civil Engineeng* at Third Year B Tech Semester V and VI pre-revised Program under the faculty of Engineering and Technology is as follows. One major change is in the name of the Program as B.Tech (Civil Engineering) at the place of B.Tech (*Civil Engineeng*).

Third Year B.Tech Semester V (Civil Engineering)

Sr. No	Third Year B.Tech. (Civil Engineering) Semester V Pre-revised syllabus	Third Year B.Tech. (Civil Engineering) Semester V Revised syllabus	Remark
1.	Design of Steel Structures	Design of Steel Structures	Course objective statements and course outcome statements are revised also, contents are revised wherever necessary.
2.	Transportation Engineering –I	Transportation Engineering –I	
3.	Geotechnical Engineering- I	Geotechnical Engineering- I	
4.	Environmental Engineering-I	Environmental Engineering-I	
5.	Construction Management	Construction Management	
6.	Lab-I Transportation Engineering –I	Lab-I Transportation Engineering –I	
7.	Lab-II Geotechnical Engineering- I	Lab-II Geotechnical Engineering- I	
8.	Lab-III Environmental Engineering-I	Lab-III Environmental Engineering-I	
9.	Seminar	Seminar	
10.	Internship-I	Internship-I	
11.	Introduction to Foreign Language	Introduction to Foreign Language	

Third Year B.Tech Semester VI (Civil Engineering)

Sr. No	Third Year B Tech(*Civil Engineeng*) Semester VI Pre-revised syllabus	Third Year B.Tech (Civil Engineering) Semester VI Revised syllabus	Remark
1.	Theory of Structures -II	Theory of Structures -II	Course objective statements and course outcome statements are revised also, contents are revised wherever necessary.
2.	Water Resource Engineering -I	Water Resource Engineering -I	
3.	Transportation Engineering –II	Transportation Engineering –II	
4.	Environmental Engineering-II	Environmental Engineering-II	
5.	Geotechnical Engineering- II	Geotechnical Engineering- II	
6.	Lab-II Environmental Engineering-II	Lab-II Environmental Engineering-II	
7.	Lab-III Structural Design Drawing-I	Lab-III Structural Design Drawing-I	
8.	Internship-II	Internship-II	
9.	Mini Project	Mini Project	
10.	Lab-II Environmental Engineering-II	Lab-II Environmental Engineering-II	
11.	Research Methodology	Research Methodology	

Audit courses have been assigned no any credits. The students will be evaluated for these courses by the concerned course in charge. There will be grade conferred to the student. The grade will be based on conversion of marks obtained out of 50. Obtaining passing grade is essential condition.