R22

ACADEMIC REGULATIONS, COURSE STRUCTURE, AND DETAILED SYLLABUS

CIVIL ENIGINEERING

Applicable to

B.Tech Regular Four Year Degree Programme

(For the Batches admitted from the Academic Year 2022-23)

B.Tech (Lateral Entry Scheme)

(For the Batches admitted from the Academic Year 2023-2024)

Offered under Choice Based Credit System (CBCS)

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

(UGC- AUTONOMOUS)

Sponsored by TKR Educational Society, Approved by AICTE, Affiliated to JNTUH
Accredited by NAAC with 'A' Grade. Accredited by NBA

(Medbowli, Meerpet, Balapur(M), Hyderabad, Telangana- 500097)

College

Vision:
Imparting Knowledge and instilling skills to the aspiring students in the field of Engineering, Technology, Science and Management to face the emerging challenges of the society.

Mission:
- Encouraging scholarly activities that transfer knowledge in the areas of Engineering, Technology, Science and Management.

- Ensuring students of all levels, well trained to meet the needs of education and their future endeavors.

- Inculcating human values and ethics into the education system for the all-round development of the students.

Department

About Department:
The department was established in the year of 2009 with a intake of 60 students now its 120. The Department offers a four-year UG course leading to B.Tech in Civil Engineering. The department has energetic and experienced faculty (Industrial & Teaching) for the benefit of the students and to promote R&D. The department has conducted National Conferences, Workshops, Seminars, Guest lecture, Industrial & Field Visits, etc to update the Technical knowledge of students. The department has fully equipped laboratories and all infrastructures to meet the academic requirements.

Vision:
To impart technical knowledge in the field of civil engineering and expose the graduate students to the technology.

Mission:
- To provide good theoretical and practical knowledge to the students during their course of study, and create awareness in technology.

- To encourage students for higher studies and to have research oriented direction.

- After completion of course, the students are empowered with good technical knowledge, employability and ethical values to serve the nation.

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1.0   Under Graduate Degree Programme in Engineering & Technology (UGP in E&T)

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE (TKREC) offers a 4-year (8 semesters) **Bachelor of Technology** (B.Tech.) degree programme, under Choice BasedCredit System (CBCS) in all branches of Engineering with effect from the Academic Year 2022-23

2.0. Eligibility for Admission

2.1.   Admission to the undergraduate (UG) programme shall be made either on the basis of the merit rank obtained by the qualified student in entrance test conducted by the Telangana State Government (EAMCET) or the University or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the government from time to time.

2.2.   The medium of instructions for the entire undergraduate programme in Engineering & Technology will be **English** only.

3.0 B.TECH. PROGRAMME STRUCTURE

3.1. A student after securing admission shall complete the B.Tech. programme in a minimumperiod of **four** academic years (8 semesters), and a maximum period of **eight** academic years (16 semesters) starting from the date of commencement of first year first semester,failing which student shall forfeit seat in B.Tech course. Each student shall secure 160 credits (with CGPA ≥ 5) required for the completion of the undergraduate programme and award of the B.Tech. Degree.

3.2. UGC/ AICTE specified definitions/ descriptions are adopted appropriately for various terms and abbreviations used in these academic regulations/ norms, which are listed below.

3.2.1. Semester Scheme

Each undergraduate programme is of 4 academic years (8 semesters) with the academic year divided into two semesters of 22 weeks (≥ 90 instructional days) each and in each semester - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)' under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) indicated by UGC, and curriculum /course structure suggested by AICTE are followed.

3.2.2 Credit Courses

All subjects/ courses are to be registered by the student in a semester to earn credits which shall be assigned to each subject/ course in an L: T: P: C (Lecture periods: Tutorial periods: Practical periods: Credits) structure based on the following general pattern.

❖ One credit for one hour/ week/ semester for Theory/ Lecture (L) courses or Tutorials.

❖ One credit for two hours/ week/ semester for Laboratory/ Practical (P) courses.

Courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization Lab are mandatory courses. These courses will not carry any credits.

3.2.3 Subject Course Classification

All subjects/ courses offered for the undergraduate programme in E&T (B.Tech. degree programmes) are broadly classified as follows. The College

has followed almost all the guidelines issued by AICTE/UGC.

S. NO.	CATEGORY	Suggested breakup of credits (Total 160)
1	Humanities and Social sciences including Management	10*
2	Basic Sciences	22.5*
3	Engineering Sciences courses including Workshop, Drawing, basics of Electrical /Mechanical / Computer etc.	18.5*
4	Professional Core Courses	63*
5	Professional Elective Courses relevant to chosen specialization/branch	19*
6	Open Electives-Electives from other technical and/or emerging subjects	9*
7	Project work, Seminar and Internship in Industry or elsewhere	18*
8	Mandatory courses [Environmental Sciences, Induction Training, Indian Constitution, Essence of Indian Traditional Knowledge]	(non- credit)
	Total	**160***

* Variation is allowed as per the need of the respective disciplines.

3.2.4. Subject Code Classification

The subject codes of various branches in TKREC Regulations are formulated using the following Procedure

Regulation, Branch, Semester, Classification, S. No.

Regulation	20, 21, 22, …., and so on
UG Branch	Corresponding branch code like CE,EE …..etc
Semester	01, 02, 03, 04, 05, 06, 07, 08
Classification	HS-Humanities and Sciences, BS-Basic Sciences, ES-Engineering Sciences, PC- Professional Core, PE- Professional Elective, OE-Open Elective, PW-Project Work
S. No.	01 to 09

4.0. COURSE REGISTRATION

4.1. A 'faculty advisor or counselor' shall be assigned to a group of 20 students, who will advise the students about the undergraduate programme, its course structure and curriculum, choice/option for subjects/ courses, based on their competence, progress, pre-requisites and interest.

4.2. The academic section of the college invites 'registration forms' from students before the beginning of the semester through 'on-line registration', ensuring 'date and time stamping'. The on-line registration requests for any 'current semester' shall be **completed before the commencement of SEEs (Semester End Examinations) of the 'preceding semester**'.

4.3. A student can apply for **on-line** registration, **only after** obtaining the '**written approval**' from faculty advisor / counselor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with the Head of the Department, Faculty Advisor / Counselor and the student.

4.4. A student may be permitted to register for all the subjects/ courses in a semester as specified in the course structure with maximum additional subject(s) / course(s) limited to 6 Credits (any 2 elective subjects), based on **progress** and SGPA/ CGPA, and completion of the '**pre-requisites'** as indicated for various subjects / courses, in the department course structure and syllabus contents.

4.5. Choice for '**additional subjects/ courses**', not more than any 2 elective subjects in any Semester, must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor / Mentor / HOD.

4.6. If the student submits ambiguous choices or multiple options or erroneous entries during **on-line** registration for the subject(s) / course(s) under a given/ specified course group/ category as listed in the course structure, only the first mentioned subject/ course in that category will be taken into consideration.

4.7. Subject / course options exercised through **on-line** registration are final and **cannot** be changed or inter-changed; further, alternate choices also will not be considered. However,if the subject/ course that has already been listed for registration by the Head of the Department in a semester could not be offered due to any inevitable or unexpected reasons, then the student shall be allowed to have alternate choice either for a new subject(subject to offering of such a subject), or for another existing subject (subject to availability of seats). Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within **a week** after the commencement of class-work for that semester.

4.8. Dropping of subjects/ courses may be permitted, only after obtaining prior approval from the faculty advisor/ counselor 'within a period of 15 days' from the beginning of the current semester.

4.9**. Open Electives**: The students have to choose three Open Electives (OE-I, II & III) from the list of Open Electives given by other departments. However, the student can opt for an Open Elective subject offered by his own (parent) department, if the student has not registered and not studied that subject under any category (Professional Core, Professional Electives, Mandatory Courses etc.) offered by parent department in any semester. Open Elective subjects already studied should not repeat / should not match with any category (Professional Core, Professional Electives, and Mandatory Courses etc.) of subjects even in the forthcoming semesters.

4.10**. Professional Electives**: The students have to choose six Professional Electives (PE-I to VI) from the list of professional electives given.

5.0. SUBJECTS / COURSES TO BE OFFERED

5.1. A subject/ course may be offered to the students, **only if** a minimum of 15 students opt for it.

5.2. More than **one faculty member** may offer the **same subject** (lab/ practical may be included with the corresponding theory subject in the same semester) in any semester. However, selection of choice for students will be based on - '**first come first serve** basis and CGPA criterion' (i.e. the first focus shall be on early **on-line entry** from the student for registration in that semester, and the second focus, if needed, will be on CGPA of the student).

5.3. If more entries for registration of a subject come into picture, then the Head of the Department concerned shall decide, whether or not to offer such a subject / course for **two (or multiple) sections**.

5.4. In case of options coming from students of other departments/ branches/ disciplines (not considering **open electives**), first **priority** shall be given to the student of the '**parent department**'.

6.0. ATTENDANCE REQUIREMENTS

6.1. A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% of attendance in aggregate of all the subjects/ courses (including attendance in mandatory courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization Lab) for that semester. **Two periods** of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject. **This attendance should alsobe included in the attendance submitted every fortnight to the College Examination Branch.**

6.2. Shortage of attendance in aggregate upto 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.

6.3. A stipulated fee shall be payable for condoning of shortage of attendance.

6.4. Shortage of attendance below 65% in aggregate shall in **NO** case be condoned.

6.5. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled, including all academic credentials (internal marks etc.) of that semester**. They will not be promoted to the next semester.** They may seek re-registration for all those subjects registered in that semester in which the student is detained, by seeking re-admission into that semester as and when offered; if there are any professional electives and/ or open electives, the same may also be re- registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

6.6. A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

7.0. ACADEMIC REQUIREMENTS

The following academic requirements have to be satisfied, in addition to the attendancerequirements mentioned in Item No. **6**.

7.1. A student shall be deemed to have satisfied the academic requirements and earned the credits

allotted to each subject/ course, if student secures not less than 35% (14 marks out of 40 marks including minimum 35% of average Mid-Term examinations for 25 marks) in the internal examinations, not less than 35% (21 marks out of 60 marks) in the semester end examination, and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing **'C'** grade or above in that subject/ course.

7.2. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship (or) Seminar, if the student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student is deemed to have failed, if he (i) does not submit a report on Industry Oriented Mini Project / Internship, or (ii) not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in Real-time ResearchProject (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship evaluations.

A student may reappear once for each of the above evaluations, when they are scheduled again; if the student fails in such 'one reappearance' evaluation also, the student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

7.3. **Promotion Rules**

S. No.	Promotion	Conditions to be fulfilled
1	**First year first semester to firstyear second semester**	**Regular course of study of first year first semester.**
2	**First year second semester to Second year first semester**	**(i) Regular course of study of first yearsecond semester.** **(ii) Must have secured at least 20 credits out of 40 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whetherthe student takes those examinations or not.**
3.	**Second year first semester to Second year second semester**	**Regular course of study of second year first semester.**
4	**Second year second semester toThird year first semester**	**(i) Regular course of study of second year second semester.**

		(ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	**Third year first semester to Thirdyear second semester**	**Regular course of study of third year first semester.**
6	**Third year second semester to Fourth year first semester**	**(i) Regular course of study of third year second semester.** **(ii) Must have secured at least 72 credits out of 120 credits i.e., 60% credits up to third year second Semester from all the relevant regular and supplementary examinations,whether the student takes those examinations or not.**
7	**Fourth year first semester toFourth year second semester**	**Regular course of study of fourth year first semester.**

7.4. A student (i) shall register for all courses /subjects covering 160 credits as specified and listed in the course structure, (ii) fulfills all the attendance and academic requirements for 160 credits, (iii) earn all 160 credits by securing SGPA $\geq$ 5.0 (in each semester), and CGPA $\geq$ 5 (at the end of 8 semesters), (iv) **passes all the mandatory courses,** to successfully complete the undergraduate programme. The performance of the student in these 160 credits shall be considered for the calculation of the final CGPA **(at the end of undergraduate programme),** and shall be indicated in the grade card / marks memo of IV-year II semester.

7.5. If a student registers for '**extra subjects**' (in the parent department or other departments / branches of Engg.) other than those listed subjects totaling to 160 credits as specified in the course structure of his department, the performances in those '**extra subjects**' (although evaluated and graded using the same procedure as that of the required 160 credits) will not be considered while calculating the SGPA and CGPA. For such '**extra subjects**' registered, percentage of marks and letter grade alone will be indicated in the grade card / marks memo as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations Items 6 and 7.1 – 7.4 above.

7.6. A student eligible to appear in the semester end examination for any subject/ course, but absent from it or failed (thereby failing to secure **'C'** grade or above) may reappearfor that subject/ course in the supplementary examination as and when conducted. In such cases, internal marks (CIE) assessed earlier for that subject/ course will be carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating performance in that subject.

7.7. A student **detained in a semester due to shortage of attendance may be re-admitted in the same semester in the next academic year for fulfillment of academic requirements**. The academic regulations under which a student has been re-admitted shall be applicable. Further, no grade allotments or SGPA/ CGPA calculations will be done for the entire semester in which the student has been detained.

7.8. A student detained **due to lack of credits, shall be promoted to the next academic year only after acquiring the required number of academic credits.** The academic regulations under which the student has been readmitted shall be applicable to him.

8.0. EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS

8.1. The performance of a student in every subject / course (including practical and Project Stage – I & II) will be evaluated for 100 marks each, with 40 marks allotted for CIE (Continuous Internal Evaluation) and 60 marks for SEE (Semester End-Examination).

8.2. In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Each Mid-Term examination consists of one part for 30 marks with a total duration of 2 hours as follows:

      1. Midterm Examination in descriptive mode for 30 marks:

The remaining 10 marks of Continuous Internal Assessment (out of 40) are distributed as:

      2. Assignment for 5 marks. (Average of 2 Assignments each for 5marks)

      3. Subject Viva-Voce / PPT / Poster Presentation / Case Study on a topic in the concerned subject for 5 marks.

The descriptive paper shall contain 5 full questions out of which, the student has to answer all the questions, each carrying 6 marks and internal choice may be given. Average of two mid-term examinations (I Mid-Term & II Mid-Term) will be taken as final marks for mid-term examinations (For 30 marks).

While the first mid-term examination shall be conducted on 50% of the syllabus, the second mid-term examination shall be conducted on the remaining 50% of the syllabus.

Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks).

Subject Viva-Voce / PPT / Poster Presentation / Case Study on a topic in the subject concerned for 5 marks before II Mid-Term Examination.

❖ The student, in each subject, shall have to earn 35% of marks(i.e.14 marks out of 40 marks) in CIE, 35% of marks (i.e.21 marks out of 60) in SEE and overall 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together to get pass grade (i.e. **C**) or above.

❖ The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 continuous Internal Examination (CIE) marks.

❖ In case, the student appears for Semester End Examination of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled in spite of appearing the SEE.

There is NO Computer Based Test (CBT) for R22 regulations.

8.2.1 The semester end examinations (SEE), for theory subjects, will be conducted for 60marks consisting of two parts viz. i) **Part- A** for 10 marks, ii) **Part - B** for 50 marks.

❖ Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.

❖ Part-B consists of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from each unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

The duration of Semester End Examination is 3 hours.

The details of evaluation of end semester exam are as follows

❖ Double evaluation of the answer scripts for the External Examinations is followed.

❖ The average of the two evaluations shall be considered as final marks.

❖ If the difference of two valuations is more than or equal to15 marks, third evaluation shall be recommended.

❖ If any difference appeared in the marks after the third valuation also, average of two evaluations will be considered whose difference is minimum, as final marks.

The details of challenging valuation of end semester exam are as follows

❖ There shall not be any recounting or re-evaluation for all subjects as the double valuation was adopted. But, the students will be given a chance to apply for challenging valuation for all the theory Subjects (no Practical/lab subjects) within one week from the date of declaration of results.

❖ Whenever the students apply for challenge valuation of answer scripts of semester end examinations, the students should submit their applications (through the HOD) within one week from the date of declaration of the results to the Examination Branch by paying Rs.10,000 (Rupees Ten Thousand only) per subject, in the form of Demand Draft, Drawn in Favor of "TKREC AUTONOMOUS". Any application received after the due date of submission for Challenge valuation, shall not be accepted under any circumstances.

On receipt of the DD

The answer script of the applied subject will be shown to the candidate to verify whether it belongs to him or not and the script will be evaluated by the senior faculty of the college appointed by the Controller of examinations. If there is any change in marks (Equal or above 15% of the maximum marks) the new marks will be awarded to the student. Otherwise, there will be no change in old marks. If the change in marks (Equal or above 15% of the maximum marks) occurs, an amount of Rs.9,000/- will be refunded to the student. Otherwise, the student will forfeit the total amount which he /she paid.

8.2.2. For the subject, Computer Aided Engineering Graphics, the Continuous Internal Evaluation(CIE) and Semester End Examinations (SEE) evaluation pattern is same as for other theory subjects.

8.3 For practical subjects there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and 60 marks for semester end examination. Out of the 40 marks for internal evaluation:

1. A write-up on day-to-day experiment in the laboratory (in terms of aim, components / procedure, expected outcome) which shall be evaluated for 10 marks.
2. **10 marks for viva-voce (**or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.
3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.
4. The remaining 10 marks are for Laboratory Project, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before

semester end practical examination.

The Semester End Examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the cluster / other colleges which will be decided by the examination branch of the college.

In the Semester End Examination held for 3 hours, total 60 marks are divided and allocated as shown below:

10 marks for write-up

15 marks for experiment/program

15 marks for evaluation of results

10 marks for presentation on another experiment / program in the same laboratory course and

10 marks for viva-voce on concerned laboratory course

❖ The student, in each subject, shall have to earn 35% of marks(i.e.14 marks out of 40 marks) in CIE, 35% of marks (i.e.21 marks out of 60) in SEE and overall 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together to secure Pass grade (i.e. "C") or above.

❖ The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 continuous Internal Examination (CIE) marks.

❖ In case, the student appears for Semester End Examination of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled in spite of appearing the SEE.

8.4 The evaluation of courses having ONLY internal marks in I-Year I Semester and II- Year II Semester is as follows:

1) I Year I Semester course (*ex., Elem ents of CE / ME / EEE / ECE / CSE*): The Continuous Internal Evaluation (CIE) is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations are the final for 50 marks. Student shall have to earn 40%, i.e. 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) is absent as per schedule,or (ii) secures less than 40% marks in this course.

For CSE / IT and allied branches the Continuous Internal Evaluation (CIE) will be for 50 marks. Each Mid-Term examination consists of two parts i) Part – A for 20 marks, ii) Part – B for 20 marks with a total duration of 2 hours.

Part A: Objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 20 marks.

Part B: Descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks.

The remaining 10 marks of Continuous Internal Evaluation are for Assignment (5 marks) and Subject Viva-Voce / PPT / Poster Presentation / Case Study (5 marks) and the evaluation pattern will remain same as for other theory subjects.

For all other branches, the Continuous Internal Evaluation (CIE) will be for 50 marks. Out of the 50 marks for internal evaluation:

a) A write-up on day-to-day experiment in the laboratory (in terms of aim, components/procedure, expected outcome) which shall be evaluated for 10 marks

b) 10 marks for viva-voce (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.

c) Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 15 marks.

d) The remaining 15 marks are for Laboratory Report/Project and Presentation, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

2) II Year II Semester *Real-Time (or) Field-based Research Project* course: The Continuous Internal Evaluation (CIE) is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations are the final for 50 marks. Student shall have to earn 40%, i.e. 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the internal committee as per schedule, or (iii) secures less than 40% marks in this course..

8.5. There shall be Industry training (or) Internship (or) Industry oriented Mini-project (or) Skill Development Courses (or) Paper presentation in reputed journal (or) Industry Oriented Mini Project in collaboration with an industry of their specialization. Students shall register for this immediately after II-Year II Semester Examinations and pursue it during summer vacation /semester break & during III Year without effecting regular course work. Internship at reputed organization (or) Skill development courses (or) Paper presentation in reputed journal (or) Industry Oriented Mini Project

shall be submitted in a report form and presented before the committee in III-year II semester before end semester examination. It shall be evaluated for 100 external marks. The committee consists of an External Examiner, Head of the Department, Supervisor of the Industry Oriented Mini Project (or) Internship etc, Internal Supervisor and a SeniorFaculty Member of the Department. There shall be **NO internal marks** for Industry Training (or) Internship (or) Mini-Project (or) Skill Development Courses (or) Paper Presentation in reputed journal (or) Industry Oriented Mini Project.

8.6. The UG project shall be initiated at the end of the IV Year I Semester and the durationof the project work is one semester. The student must present Project Stage – I during IV Year I Semester before II Mid examinations, in consultation with his Supervisor, the title, objective and plan of action of his Project work to the departmental committee for approval before commencement of IV Year II Semester. Only after obtaining the approval of the departmental committee, the student can start his project work.

8.7. UG project work shall be carried out in two stages: Project Stage – I for approval of project before Mid-II examinations in IV Year I Semester and Project Stage – II during IV Year II Semester. Student has to submit project work report at the end of IV Year IISemester. The project shall be evaluated for 100 marks before commencement of SEE Theory examinations.

8.8. For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall approve the project work to begin before II Mid-Term examination of IV Year I Semester. The student is deemed to be not eligible to register for the Project work, if he does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule.

A student who has failed may reappear once for the above evaluation, when it is scheduled again; if he fails in such 'one re appearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

8.9. For Project Stage – II, the external examiner shall evaluate the project work for 60 marks and the internal project committee shall evaluate it for 40 marks. Out of 40 internal marks, the departmental committee consisting of Head of the Department, Project Supervisor and a Senior Faculty Member shall evaluate the project work for 20marks and Project Supervisor shall evaluate for 20 marks. The topics for Industry Oriented Mini Project / Internship / SDC etc. and the main Project shall be different fromthe topic already taken. The student is deemed to have failed, if he / she (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the External Examiner as per schedule, or (iii) secures less than 40% marks in the sum totalof the CIE and SEE taken together.

For conducting viva-voce of project, Controller and Principal selects an external examiner from the list of experts in the relevant branch submitted by the HOD concerned

A student, who has failed, may reappear once for the above evaluation, when it is scheduled again; if student fails in such 'one re appearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

8.10. A student shall be given one time chance to re-register for a maximum of two subjects in a semester

> If the internal marks secured by a candidate in the continuous Internal Evaluation marks for 40 (sum of average of two mid-term exams and two assignments & subject Viva-voce / PPT / Poster presentation / Case Study on the topic in concerned subject) are less than 35% and failed in those subjects.

> A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the class work in next academic year.

In the event of the student taking this chance, his Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled

9.0 GRADING PROCEDURE

9.1. Grades will be awarded to indicate the performance of students in each Theory Subject, Laboratory/ Practical's / Industry-Oriented Mini Project/Internship / SDC and Project Stage. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade shall be given.

9.2. As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	O (Outstanding)	10
80 and less than 90%	A+ (Excellent)	9
70 and less than 80%	A (Very Good)	8
60 and less than 70%	B+ (Good)	7

50 and less than 60%	B (Average)	6
40 and less than 50%	C (Pass)	5
Below 40%	F (FAIL)	0
Absent	Ab	0

9.3. A student who has obtained an '**F'** grade in any subject shall be deemed to have '**failed'** and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

9.4. To a student who has not appeared for an examination in any subject, '**Ab'** grade will be allocated in that subject, and he is deemed to have '**Failed'**. A student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remainthe same as those obtained earlier.

9.5. A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

9.6. A student earns Grade Point (GP) in each subject/ course, on the basis of the letter grade secured in that subject/ course. The corresponding 'Credit Points' (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

Credit Points (CP) = Grade Point (GP) x Credits …. For a course

9.7. A student passes the subject/course only when GP $\geq$ **5 ('C' grade or above)**

9.8. The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points ($\sum$CP) secured from all subjects / courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to **two** decimalplaces. SGPA is thus computed as

$$\textbf{SGPA} = \{\sum_{i=1}^{n} \textbf{Ci Gi}\}/\{\sum_{i=1}^{n} \textbf{Ci}\} \ldots \ldots \textbf{For each semester},$$

where 'i' is the subject indicator index (considering all subjects in a semester), 'N' is the no. of subjects '**registered'** for the semester (as specifically required and listed under the course structure of the parent department), C_i is the no. of credits allotted to the ith subject, and G_i represents the grade points (GP) corresponding to the letter grade awarded for that i^{th} subject.

9.9. The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in **all** registered courses (of 160) in **all** semesters, and the total number of credits registered in **all** the semesters. CGPA is rounded off to **two** decimal places. CGPA is thus computed from the I year II semester onwards at the end of each semester as per the formula

$$\text{CGPA} = \{ \sum_{j=1}^{m} Cj\ Gj \} / \{ \sum_{j=1}^{m} Cj \} \text{ for all S Semesters Registered}$$

(i.e., up to and inclusive of S semesters, S ≥ 2),

where '**M**' is the **total** no. of subjects (as specifically required and listed under the course structure of the parent department) the student has '**registered**' i.e., from the 1st semester onwards up to and inclusive of the 8th semester, 'j' is the subject indicator index (takes into account all subjects from 1 to 8 semesters), C_j is the no. of credits allotted to the jth subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} subject. After registration and completion of I year I semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

Course/Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	4 x 8 = 32
Course 2	4	O	10	4 x 10 = 40
Course 3	4	C	5	4 x 5 = 20
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	3	C	5	3 x 5 = 15
	21			152

SGPA = 152/21 = 7.24

Illustration of Calculation of CGPA up to 3rd Semester:

Semester	Course/ Subject Title	Credits Allotted	Letter Grade Secured	Corresponding Grade Point (GP)	Credit Points (CP)
I	Course 1	3	A	8	24
I	Course 2	3	O	10	30
I	Course 3	3	B	6	18
I	Course 4	4	A	8	32
I	Course 5	3	A+	9	27
I	Course 6	4	C	5	20
II	Course 7	4	B	6	24

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II	Course 8	4	A	8	32
II	Course 9	3	C	5	15
II	Course 10	3	O	10	30
II	Course 11	3	B+	7	21
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30
III	Course 15	2	A	8	16
III	Course 16	1	C	5	5
III	Course 17	4	O	10	40
III	Course 18	3	B+	7	21
III	Course 19	4	B	6	24
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
	Total Credits	69		Total Credit Points	518

CGPA = 518/69 = 7.51

The calculation process of CGPA illustrated above will be followed for each subsequent semester until 8th semester. The CGPA obtained at the end of 8th semester will become the final CGPA secured for entire B.Tech. programme.

9.10. For merit ranking or comparison purposes or any other listing, **only** the '**rounded off'** values of the CGPAs will be used.

9.11. SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all subjects of that semester are passed in first attempt. Otherwise the SGPA and CGPA shall be mentioned only on the Memorandum of Grades in which sitting he passed his last exam in that semester. However, mandatory courses will not be taken into consideration.

10.0. PASSING STANDARDS

10.1. A student shall be declared successful or 'passed' in a semester, if he secures a GP ≥ 5 ('C' grade or above) in every subject/course in that semester (i.e. when the student gets an SGPA ≥ 5.0 at the end of that particular semester); and he shall be declared successful or 'passed' in the entire undergraduate programme, only when gets a CGPA ≥ 5.00 ('C' grade or above) for the award of the degree as required.

10.2. After the completion of each semester, a grade card or grade sheet shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, grade earned, etc.) and credits

earned. **There is NO exemption of credits in any case.**

11.0. Declaration of results

11.1. Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9.

11.2. For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

$$\% \text{ of Marks} = (\text{final CGPA} - 0.5) \times 10$$

12.0. Award of Degree

12.1. A student who registers for all the specified subjects/ courses as listed in the course structure and secures the required number of 160 credits (with CGPA $\geq$ 5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have '**qualified**' for the award of B.Tech. Degree in the branch of Engineering selected at the time of admission.

12.2. A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes.

12.3. A student with final CGPA (at the end of the undergraduate programme) > 8.00, and fulfilling the following conditions - shall be placed in '**First Class with Distinction**'.
However, he

(i)   Should have passed all the subjects/courses in '**First Appearance**' within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.

(ii)   Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason.

A student not fulfilling any of the above conditions with final CGPA > 8 shall be placed in '**First Class**'.

12.4. Students with final CGPA (at the end of the undergraduate programme) $\geq$ 7.0 but < 8.00 shall be placed in '**First Class**'.

12.5. Students with final CGPA (at the end of the undergraduate programme) $\geq$ 6.00 but < 7.00, shall be placed in '**Second Class**'.

12.6. All other students who qualify for the award of the degree (as per item 12.1), with final CGPA (at the end of the undergraduate programme) $\geq$ 5.00 but < 6, shall be placed in '**pass class**'.

12.7. A student with final CGPA (at the end of the undergraduate programme) < 5.00 will not be eligible for the award of the degree.

12.8. Students fulfilling the conditions listed under item 12.3 alone will be eligible for award of '**Gold Medal**'.

12.9**. Award of 2-Year B.Tech. Diploma Certificate**

1. A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) up to B. Tech. – II Year – II Semester, if the student want to exit the 4-Year B. Tech. program. The student **once opted and awarded for 2-Year UG Diploma Certificate, the student will not be permitted to join** in B. Tech. III Year – I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree.

2. A student may be permitted to take one year break after completion of II Year – II Semester or B. Tech. – III Year – II Semester (with university permission through the principal of the college well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).

13.0 WITHHOLDING OF RESULTS

13.1 If the student has not paid the fees to the College at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and the student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

14.0. TRANSITORY REGULATIONS

A.   For students detained due to shortage of attendance:

(1) A Student who has been detained in I year of R20 Regulations due to lack of attendance, shall be permitted to join I year I Semester of R22 Regulations and he is required to complete the study of B.Tech./B. Pharmacy programme within the stipulated period of eight academic years from the date of first admission in I Year.

(2) A student who has been detained in any semester of II, III and IV years of R20 regulations for want of attendance, shall be permitted to join the corresponding semester of R22 Regulations and is required to complete the study of B.Tech./B. Pharmacy within the

stipulated period of eight academic years from the date of first admission in I Year. The R22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.

B.   For students detained due to shortage of credits:

(i) A student of **R20** Regulations who has been detained due to lack of credits, shall be promoted to the next semester of **R22** Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The total credits required are 160 including both **R20 & R22** regulations. The student is required to complete the study of B.Tech. within the stipulated period of eight academic years from the year of first admission. The **R22** Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C.   For readmitted students in **R22** Regulations:

(i) A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.

(ii) The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including R22 Regulations. **There is NO exemption of credits in any case**.

(iii) If a student is readmitted to R22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R22 Regulations will be substituted by another subject to be suggested by the University.

Note: If a student readmitted to R22 Regulations and has not studied any subjects/topics in his/her earlier regulations of study which is prerequisite for further subjects in R22 Regulations, the College Principals concerned shall conduct remedial classes to cover those subjects/topics for the benefit of the students.

15.0 STUDENT TRANSFERS

15.1. There shall be no branch transfers after the completion of admission process.

15.2. There shall be no transfers from one college/stream to another within the college.

15.3. The students seeking transfer to TKREC from various other Universities / institutions have to pass the failed subjects which are equivalent to the subjects of TKREC, and also pass the subjects of TKREC which the students have not studied at the earlier institution. Further, though the students

have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of TKREC, the students have to study those subjects in TKREC in spite of the fact that those subjects are repeated.

15.4 The transferred students from other Universities/Institutions to TKREC who are on rolls are to be provided one chance to write the CBT (for internal marks) in the **equivalent subject(s)** as per the clearance letter issued by the University.

15.5 The College will provide one chance to write the internal examinations in the equivalent subject(s) to the students transferred from other Universities/ institutions to TKREC who are on rolls, as per the clearance equivalence) letter issued by the University.

16.0 SCOPE

16.1. The academic regulations should be read as a whole, for the purpose of any interpretation.

16.2. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

16.3. The University may change or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the dates notified by the University authorities.

16.4. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

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TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

<u>ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME) FROMTHE AY 2023-24</u>

1. **<u>Eligibility for the award of B.Tech Degree (LES)</u>**

   The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.

2. The student shall register for 120 credits and secure 120 credits with CGPA ≥ 5 from II year to IV-year B.Tech Programme (LES) for the award of B.Tech. degree.

3. The students, who fail to fulfill the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.

4. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech. (LES).

5. **<u>Promotion rule</u>**

S. No	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	(i) Regular course of study of second year second semester. (ii) Must have secured at least 24 credits out of 40 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third year first semester.
4	Third year second semester to fourth year first semester	(i) Regular course of study of third year second semester. (ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester

6. All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

7. LES students are not eligible for 2-Year B. Tech. Diploma Certificate.

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MALPRACTICES RULES

DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices /Improper conduct	Punishment
	If the candidate:	
1.(a)	Possesses or keeps accessible in examination hall, any paper, notebook, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject to the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination).	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam Hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject to the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and the relevant material will be kept in the Examinations Branch.

3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all College examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also de barred for two consecutive semesters from class work and all **College** examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent/	In case of students of the college, they shall be expelled from

	any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in- charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	examination halls and cancellation of their performance in that subject and allot her subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any par there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all **College** examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also

		debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered Against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester / year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the **Controller/Principal** for further action to award suitable punishment.	

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B.Tech. in CIVIL ENGINEERING
COURSE STRUCTURE, I & II YEAR SYLLABUS (R22 Regulations)

Applicable from AY 2022-23 Batch

I YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Matrices and Calculus	3	1	0	4
2.		Applied Physics	3	1	0	4
3.		C Programming and Data Structures	3	0	0	3
4.		Engineering Workshop	0	1	3	2.5
5.		English for Skill Enhancement	2	0	0	2
6.		Elements of Civil Engineering	0	0	2	1
7.		Applied Physics Laboratory	0	0	3	1.5
8.		English Language and Communication Skills Laboratory	0	0	2	1
9.		C Programming and Data Structures Laboratory	0	0	2	1
10.		Environmental Science	3	0	0	0
11.		Induction Programme				
		Total	**14**	**3**	**12**	**20**

I YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Ordinary Differential Equations and Vector Calculus	3	1	0	4
2.		Engineering Chemistry	3	1	0	4
3.		Computer Aided Engineering Graphics	1	0	4	3
4.		Applied Mechanics	3	0	0	3
5.		Surveying	2	0	0	2
6.		Python Programming Laboratory	0	1	2	2
7.		Engineering Chemistry Laboratory	0	0	2	1
8.		Surveying Laboratory - I	0	0	2	1
		Total	**12**	**3**	**10**	**20**

II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Probability and Statistics	3	1	0	4
2.		Building Materials, Construction and Planning	3	0	0	3
3.		Engineering Geology	3	0	0	3
4.		Strength of Materials – I	3	0	0	3
5.		Fluid Mechanics	3	0	0	3
6.		Surveying Laboratory - II	0	1	2	2
7.		Strength of Materials Laboratory	0	0	2	1
8.		Computer Aided Drafting Laboratory	0	0	2	1
9.		Constitution of India	3	0	0	0
		Total Credits	**18**	**2**	**6**	**20**

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II YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Basic Electrical and Electronics Engineering	3	0	0	3
2.		Concrete Technology	3	0	0	3
3.		Strength of Materials – II	3	0	0	3
4.		Hydraulics and Hydraulics Machinery	3	0	0	3
5.		Structural Analysis - I	3	0	0	3
6.		Fluid Mechanics and Hydraulics Machinery Laboratory	0	0	2	1
7.		Basic Electrical and Electronics Engineering Laboratory	0	0	2	1
8.		Concrete Technology Laboratory	0	0	2	1
9.		Real-time Research Project/ Field-Based Project	0	0	4	2
10.		Gender Sensitization Laboratory	0	0	2	0
		Total Credits	**15**	**0**	**12**	**20**

III YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Structural Analysis - II	3	0	0	3
2.		Geotechnical Engineering	3	0	0	3
3.		Structural Engineering -I (RCC)	3	0	0	3
4.		Business Economics & Financial Analysis	3	0	0	3
5.		Transportation Engineering	3	0	0	3
6.		Water Resources Engineering - I	3	0	0	3
7.		Transportation Engineering Laboratory	0	0	2	1
8.		Geotechnical Engineering Laboratory	0	0	2	1
9.		Intellectual Property Rights	3	0	0	0
		Total Credits	**21**	**0**	**4**	**20**

III YEAR II SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1.		Environmental Engineering	3	0	0	3
2.		Foundation Engineering	3	0	0	3
3.		Structural Engineering -II (Steel Structures)	3	0	0	3
4.		Professional Elective – I	3	0	0	3
5.		Open Elective - I	3	0	0	3
6.		Environmental Engineering Laboratory	0	0	2	1
7.		Computer Aided Design Laboratory	0	0	2	1
8.		Advanced English Communication Skills Laboratory	0	0	2	1
9.		Industry Oriented Mini Project/ Internship	0	0	4	2
10.		Environmental Science	3	0	0	0
		Total Credits	**18**	**0**	**10**	**20**

Environmental Science in III Yr II Sem Should be Registered by Lateral Entry Students Only.

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IV YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Quantity Survey & Valuation	2	0	0	2
2.		Project Management	2	0	0	2
3.		Professional Elective – II	3	0	0	3
4.		Professional Elective – III	3	0	0	3
5.		Professional Elective - IV	3	0	0	3
6.		Open Elective - II	3	0	0	3
7.		Civil Engineering Software Laboratory	0	0	2	1
8.		Project Stage - I	0	0	6	3
		Total Credits	**16**	**0**	**8**	**20**

IV YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Professional Elective – V	3	0	0	3
2.		Professional Elective - VI	3	0	0	3
3.		Open Elective - III	3	0	0	3
4.		Project Stage – II including seminar	0	0	22	9+2
		Total Credits	**9**	**0**	**22**	**20**

*MC – Satisfactory/Unsatisfactory

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MATRICES AND CALCULUS

B.Tech. I Year I Sem.

L	T	P	C
3	1	0	4

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: To learn
- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of eigenvalues and eigenvectors and to reduce the quadratic form to canonical form
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications

Course out comes:
After learning the contents of this paper, the student must be able to

1. Write the matrix representation of a set of linear equation s and to analyze thesolution of the system of equations
2. Find the Eigen values and Eigen vectors and reduce the quadratic form to canonical form usingorthogonal transformations.
3. Apply the mean value theorems and evaluate the improper integrals using Beta and Gamma functions.
4. Find the extreme values of functions of two variables with / without constraints.

Evaluate the multiple integrals and apply the concept to find areas, volumes.

CO PO Mapping

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		1								1		
CO2	2	3												
CO3	2	2		1								1		
CO4	2	1		1	2							1		
CO5		1										1		
AVG	2.3	2.0		1.0	2.0							1.0		

UNIT-I: Matrices   **10 L**
Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT-II: Eigen values and Eigen vectors   **10 L**
Linear Transformation and Orthogonal Transformation: Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of

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Quadratic form to canonical forms by Orthogonal Transformation.

UNIT-III: Calculus   10 L
Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series.
Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT-IV: Multivariable Calculus (Partial Differentiation and applications)   10 L
Definitions of Limit and continuity.
Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-V: Multivariable Calculus (Integration)   8 L
Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.
Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXT BOOKS:
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Editon, 2016.

REFERENCE BOOKS:
1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

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APPLIED PHYSICS

B.Tech. I Year I Sem.

L T P C
3 1 0 4

Pre-requisites: 10 + 2 Physics

Course Objectives: The objectives of this course for the student are to:
1. Understand the basic principles of quantum physics and band theory of solids.
2. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
3. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
4. Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
5. Study the characteristics of lasers and optical fibers.

Course Outcomes: At the end of the course the student will be able to:
1. Gain knowledge on fundamentals of modern physics and quantum mechanics, and utilize the knowledge in various applications.
2. Able to apply various electronic circuits by the fundamentals of semiconductor physics.
3. Study the fundamental concepts related to the dielectric, magnetic materials and superconductors
4. Identify the importance of nanoscale, quantum confinement and various fabrications
5. Able to apply the learned knowledge of LASER and Fibre optics in communication systems.

COPO MAPPING

CO's	PROGRAM OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3			1						2		
CO2	2	1			1							2		
CO3	2	1			1							1		
CO4	3			2	2							2		
CO5	2	1			1				1			1		
AVG	2.4	1.3	3.0	2.0	1.3	1.0			1.0			1.6		

UNIT - I: QUANTUM PHYSICS AND SOLIDS
Quantum Mechanics: Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect - Davisson and Germer experiment –Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.
Solids: Symmetry in solids, free electron theory (Drude & Lorentz, Sommerfeld) - Fermi-Dirac distribution - Bloch's theorem -Kronig-Penney model – E-K diagram- effective mass of electron-origin of energy bands- classification of solids.

UNIT - II: SEMICONDUCTORS AND DEVICES
Intrinsic and extrinsic semiconductors – Hall effect - direct and indirect band gap semiconductors - construction, principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT)–LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

UNIT - III: DIELECTRIC, MAGNETIC AND ENERGY MATERIALS
Dielectric Materials: Basic definitions- types of polarizations (qualitative) - ferroelectric, piezoelectric, and pyroelectric materials – applications – liquid crystal displays (LCD) and crystal oscillators.

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Magnetic Materials: Hysteresis - soft and hard magnetic materials - magnetostriction, magnetoresistance - applications - bubble memory devices, magnetic field sensors and multiferroics. Energy Materials: Conductivity of liquid and solid electrolytes- superionic conductors - materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells.

UNIT - IV: NANOTECHNOLOGY

Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods – top-down fabrication: ball milling - physical vapor deposition (PVD) - chemical vapor deposition (CVD) - characterization techniques - XRD, SEM &TEM - applications of nanomaterials.

UNIT - V: LASER AND FIBER OPTICS

Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations-lasing action - pumping methods- ruby laser, He-Ne laser, CO_2 laser, Argon ion Laser, Nd:YAG laser-semiconductor laser-applications of laser.

Fiber Optics: Introduction to optical fiber- advantages of optical Fibers - total internal reflection-construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers-losses in optical fiber - optical fiber for communication system - applications.

TEXT BOOKS:

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill, 4thEdition,2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2ndEdition,2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.

REFERENCE BOOKS:

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons,11th Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhya - Nano Materials, New Age International, 1stEdition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group Energy Materials Taylor & Francis Group, 1st Edition, 2022.

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C PROGRAMMING AND DATA STRUCTURES

B.Tech. I Year I Sem.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objectives: Introduce the importance of programming, C language constructs, program development, data structures, searching and sorting.

Course Outcomes:
1. Understand the various steps in Program development.
2. Explore the basic concepts in C Programming Language.
3. Develop modular and readable C Programs
4. Understand the basic concepts such as Abstract Data Types, Linear and Non-Linear Data structures.
5. Apply data structures such as stacks, queues in problem solving
6. To understand and analyze various searching and sorting algorithms.

UNIT - I
Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development
Introduction to C Language – Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output
Structure of a C Program – Operators, Bit-wise operators, Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Statements.

UNIT - II
Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Recursion.
Designing Structured Programs- Functions, basics, user defined functions, inter function communication, standard functions.
Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays.

UNIT - III
Pointers – Introduction, Pointers for inter function communication, pointers to pointers, compatibility,
Pointer Applications – Passing an array to a function, Memory allocation functions, array of pointers
Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion.

UNIT - IV
Derived types – The Typedef, enumerated types, Structures – Declaration, definition and initialization of structures, accessing structures, operations on structures, complex structures. Unions – Referencing unions, initializers, unions and structures.
Input and Output – Text vs Binary streams, standard library functions for files, converting file types, File programs – copy, merge files.

UNIT – V
Sorting- selection sort, bubble sort, insertion sort,
Searching-linear and binary search methods.
Data Structures – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

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TEXT BOOKS:

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education.
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

REFERENCE BOOKS:

1. C & Data structures – P. Padmanabham, 3rd Edition, B.S. Publications.
2. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
3. Programming in C – Stephen G. Kochan, III Edition, Pearson Education.
4. C for Engineers and Scientists, H. Cheng, McGraw-Hill International Edition
5. Data Structures using C – A. M. Tanenbaum, Y. Langsam, and M.J. Augenstein, Pearson Education / PHI
6. C Programming & Data Structures, E. Balagurusamy, TMH.
7. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
8. C & Data structures – E V Prasad and N B Venkateswarlu, S. Chand & Co.

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ENGINEERING WORKSHOP

B.Tech. I Year I Sem.

L	T	P	C
0	1	3	2.5

Pre-requisites: Practical skill

Course Objectives:
- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

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

1. Demonstrate various machines, tools and their operations.
2. Apply different workshop trades like fitting,carpentry, foundry and welding.
3. Practice workshop trades like Tim smithy, Blacksmithy.
4. Apply suitable tools for different trades of engineering processes including drilling, material removing, measuring, chiseling.
5. Apply basic electrical engineering knowledge for house wiring practice.

CO's	PROGRAM OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1						2	1		1		
CO2	2	2	1						2	1		1		
CO3	2	1	1						2	1		1		
CO4	2	1	1						2	1		1		
CO5	2	2	1						2	1		1		
AVG	2	1.4	1						2	1		1		

1. TRADES FOR EXERCISES:
At least two exercises from each trade:
- I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
- II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
- III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
- IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
- V. Welding Practice – (Arc Welding & Gas Welding)

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VI.   House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
VII.   Black Smithy – (Round to Square, Fan Hook and S-Hook)

2. TRADES FOR DEMONSTRATION & EXPOSURE:
Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working

TEXT BOOKS:
1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

REFERENCE BOOKS:
1. Work shop Manual - P. Kannaiah/ K.L. Narayana/ Scitech
2. Workshop Manual / Venkat Reddy/ BSP

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ENGLISH FOR SKILL ENHANCEMENT

B.Tech. I Year I Sem.		**L T P C**	
		2 0 0 2	

Course Objectives: This course will enable the students to:
1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

Course Outcomes: Students will be able to:

- Choose appropriate vocabulary and sentence structures for their oral and written communication.

- Demonstrate their understanding of the rules of functional grammar.

- Develop comprehension skills from the known and unknown passages.

- Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports invarious contexts.

- Acquire basic proficiency in reading and writing modules of English.

COPO MAPPING

CO's	PROGRAM OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3			3	3		3		
CO2						2			3	3		3		
CO3						3			2	3		3		
CO4						2			3	3		2		
CO5						3			2	3		3		
AVG						2.6			2.6	3.0		2.8		

UNIT - I
Chapter entitled '*Toasted English*' **by R.K.Narayan** from *"English: Language, Context and Culture"* published by Orient BlackSwan, Hyderabad.
Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms
Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.
Reading: Reading and Its Importance- Techniques for Effective Reading.
Writing: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT - II
Chapter entitled **'Appro JRD' by Sudha Murthy** from *"English: Language, Context and Culture"* **published** by Orient BlackSwan, Hyderabad.
Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs
Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and

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	Subject-verb Agreement.
Reading:	Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice
Writing:	Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.

UNIT - III

Chapter entitled **'Lessons from Online Learning' by F.Haider Alvi, Deborah Hurst et al** from
"English: Language, Context and Culture" published by Orient BlackSwan, Hyderabad.

Vocabulary:	Words Often Confused - Words from Foreign Languages and their Use in English.
Grammar:	Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.
Reading:	Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

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Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

UNIT - IV
Chapter entitled **'Art and Literature' by Abdul Kalam** from *"English: Language, Context and Culture"* published by Orient BlackSwan, Hyderabad.
Vocabulary: Standard Abbreviations in English
Grammar: Redundancies and Clichés in Oral and Written Communication.
Reading: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice
Writing: Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

UNIT - V
Chapter entitled **'Go, Kiss the World' by Subroto Bagchi** from *"English: Language, Context and Culture"* published by Orient BlackSwan, Hyderabad.
Vocabulary: Technical Vocabulary and their Usage
Grammar: Common Errors in English (*Covering all the other aspects of grammar which were not covered in the previous units*)
Reading: Reading Comprehension-Exercises for Practice
Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Note: *Listening and Speaking Skills which are given under Unit-6 in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.*

- ➢ **Note: 1**. As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech First Year is Open-ended,* besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.

- ➢ **Note**: **2**.Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents .They are advised to teach 40 percent of each topic from the syllabus in blended mode.

TEXT BOOK:
1. "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCE BOOKS:
1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

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ELEMENTS OF CIVIL ENGINEERING

B.Tech. I Year I Sem.

L	T	P	C
0	0	2	1

Pre-requisites: Nil

Course objectives:
- To provide practical knowledge about physical properties of minerals and rocks.
- To determine the characteristics of cement, Coarse & Fine aggregates.

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

CO1 : Identify Minerals and Rocks.
CO2 : Understand tests on Cement.
CO3 : Understand topographical features from maps & structural geology problems.
CO4 : Understand tests on Fine Aggregates.
CO5 : Understands tests on Coarse Aggregates.

COPO MAPPING

CO's	PROGRAM OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2					3			3	3		3		
CO2	2					2			3	3		3		
CO3	2					3			2	3		3		
CO4	2					2			3	3		2		
CO5	2					3			2	3		3		
AVG	2					2.6			2.6	3.0		2.8		

List of Experiments:

1. **Identification of Minerals** – Silica Group, Feldspar Group, Crystalline Group, Carbonate Group, Pyroxene Group, Mica Group, Amphibole Group.
2. **Identification of Rocks –** Igneous Petrology, Sedimentary Petrology, Metamorphic Petrology.
3. 1. Study of topographical features from Geological maps. Identification of symbols in maps.
   2. Simple structural Geology Problems (Folds, Faults & Unconformities)
4. **Tests on Cement**
   a. Fineness test & Normal Consistency test.
   b. Specific gravity test, Initial and Final setting time of cement.
5. **Tests on Fine Aggregates**
   a. Specific Gravity test.
   b. Bulking of sand & Fineness modulus of Fine aggregate.
6. **Tests on Coarse Aggregate**
   a. Specific Gravity test.
   b. Fineness modulus of Coarse aggregate.

TEXT BOOK:
1. IS 383 :1993 "Specification for Coarse and Fine Aggregates from Natural Sources for Concrete".

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APPLIED PHYSICS LABORATORY

B.Tech. I Year I Sem.
$$L \quad T \quad P \quad C$$
$$0 \quad 0 \quad 3 \quad 1.5$$

Course Objectives: The objectives of this course for the student to
1. Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
2. Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and resistivity of semiconductor materials.
3. Able to measure the characteristics of dielectric constant of a given material.
4. Study the behavior of B-H curve of ferromagnetic materials.
5. Understanding the method of least squares fitting.

Course Outcomes: The students will be able to:

1. Able to study the (V-I/P-I) characteristics of LED,LASER and Solarcell.

2. Able to understand the energy gap of semiconductor diode

3. Correlate the theory of Hall Effect with experiment by determining the Hall coefficient.

4. Examine the Bending losses for different Optical fiber cables.

5. Able to understand various concepts-Resonance, Time constant and Magnetic field using LCR, RC, Stewart and Gees circuits.

COPO MAPPING

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2		1		2				2			2		
CO2	2		1		1				2			2		
CO3	2			1	2				1			2		
CO4	2		2		1							2		
CO5	2	2	2									2		
AVG	2.0	2.0	1.5	1.0	1.3				1.5			2.0		

LIST OF EXPERIMENTS:
1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode
5. Input and output characteristics of BJT (CE, CB & CC configurations)
6. a) V-I and L-I characteristics of light emitting diode (LED)
   b) V-I Characteristics of solar cell
7. Determination of Energy gap of a semiconductor.
8. Determination of the resistivity of semiconductor by two probe method.
9. Study B-H curve of a magnetic material.
10. Determination of dielectric constant of a given material
11. a) Determination of the beam divergence of the given LASER beam
    b) Determination of Acceptance Angle and Numerical Apertureof an optical fiber.
12. Understanding the method of least squares – torsional pendulum as an example.
Note: Any 8 experiments are to be performed.

REFERENCE BOOK:
1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

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ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

B.Tech. I Year I Sem.	L	T	P	C
	0	0	2	1

The **English Language and Communication Skills (ELCS) Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Objectives:
- ✓ To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- ✓ To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
- ✓ To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- ✓ To improve the fluency of students in spoken English and neutralize the impact of dialects.
- ✓ To train students to use language appropriately for public speaking, group discussions and interviews

Course outcomes:

Students should be able to

1. Employ the nuances of English language through audio-visual experience and groupactivities.

2. Articulate a neutral accent of English for intelligibility by overcoming mother tongueinfluence.

3. Develop the skill of using appropriate language in various speaking contexts.

4. Understand how to use language to make formal presentations.

5. Interpret speaking skills with clarity and confidence which in turn enhances their interpersonal skills.

COPO MAPPING

CO's	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					3	2			3	3		3		
CO2					3	3			3	3		3		
CO3						3			3	3		3		
CO4					3				3	3		3		
CO5									3	3		3		
AVG					3.0	2.7			3.0	3.0		3.0		

Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:
a. **Computer Assisted Language Learning (CALL) Lab**
b. **Interactive Communication Skills (ICS) Lab**

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Listening Skills:
Objectives
1. To enable students develop their listening skills so that they may appreciate the role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening, so that they can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.
• Listening for general content
• Listening to fill up information
• Intensive listening
• Listening for specific information

Speaking Skills:
Objectives
1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts
• Oral practice
• Describing objects/situations/people
• Role play – Individual/Group activities

• Just A Minute (JAM) Sessions

The following course content is prescribed for the **English Language and Communication Skills Lab**.

Exercise – I
CALL Lab:
Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening.
Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*
ICS Lab:
Understand: Spoken vs. Written language- Formal and Informal English.
Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II
CALL Lab:
Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.
Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - *Testing Exercises*
ICS Lab:
Understand: Features of Good Conversation – Strategies for Effective Communication.
Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise - III
CALL Lab:
Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).
Practice: Common Indian Variants in Pronunciation – Differences between British and American

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Pronunciation -*Testing Exercises*
ICS Lab:
Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing
Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise – IV
CALL Lab:
Understand: Listening for General Details.
Practice: Listening Comprehension Tests - *Testing Exercises*
ICS Lab:
Understand: Public Speaking – Exposure to Structured Talks - Non-verbal Communication- Presentation Skills.
Practice: Making a Short Speech – Extempore- Making a Presentation.

Exercise – V
CALL Lab:
Understand: Listening for Specific Details.
Practice: Listening Comprehension Tests -*Testing Exercises*
ICS Lab:
Understand: Group Discussion
Practice: Group Discussion
Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL) Lab:**
The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.
System Requirement (Hardware component):
Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:
    i)   Computers with Suitable Configuration
    ii)   High Fidelity Headphones

2. **Interactive Communication Skills (ICS) Lab :**
The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V. or LCD, a digital stereo –audio & video system and camcorder etc.
 Source of Material (Master Copy):
* *Exercises in Spoken English. Part 1,2,3*. CIEFL and Oxford University Press

Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.

Suggested Software:
* Cambridge Advanced Learners' English Dictionary with CD.
* Grammar Made Easy by Darling Kindersley.
* Punctuation Made Easy by Darling Kindersley.
* Oxford Advanced Learner's Compass, 10th Edition.
* English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
* English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.

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- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- Digital All
- Orell Digital Language Lab (Licensed Version)

REFERENCE BOOKS:

1. (2022). *English Language Communication Skills – Lab Manual cum Workbook.* Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook.* Oxford University Press
4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient Black Swan Pvt. Ltd.
5. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* Cambridge University Press

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C PROGRAMMING AND DATA STRUCTURES LABORATORY

B.Tech. I Year I Sem.   **L T P C**
                                                                     0 0 2 1

Course Objectives: Introduce the importance of programming, C language constructs, program development, data structures, searching and sorting.

Course Outcomes:
1. Develop modular and readable C Programs
2. Solve problems using strings, functions
3. Handle data in files
4. Implement stacks, queues using arrays, linked lists.
5. To understand and analyze various searching and sorting algorithms.

List of Experiments:
1. Write a C program to find the sum of individual digits of a positive integer.
2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C program to find the roots of a quadratic equation.
5. Write a C program to find the factorial of a given integer.
6. Write a C program to find the GCD (greatest common divisor) of two given integers.
7. Write a C program to solve Towers of Hanoi problem.
8. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
9. Write a C program to find both the largest and smallest number in a list of integers.
10. Write a C program that uses functions to perform the following:
    i)   Addition of Two Matrices
    ii) Multiplication of Two Matrices
11. Write a C program that uses functions to perform the following operations:
    i)   To insert a sub-string in to a given main string from a given position.
    ii) To delete n Characters from a given position in a given string.
12. Write a C program to determine if the given string is a palindrome or not
13. Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.
14. Write a C program to count the lines, words and characters in a given text.
15. Write a C program to generate Pascal's triangle.
16. Write a C program to construct a pyramid of numbers.
17. Write a C program that uses functions to perform the following operations:
    i)   Reading a complex number
    ii)   Writing a complex number
    iii) Addition of two complex numbers
    iv)   Multiplication of two complex numbers
        (Note: represent complex number using a structure.)
18.18.
    i.   Write a C program which copies one file to another.
    ii. Write a C program to reverse the first n characters in a file.
    (Note: The file name and n are specified on the command line.)
19.19.
    i.   Write a C program to display the contents of a file.

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ii.   Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

20. Write a C program that uses functions to perform the following operations on singly linked list.:
    i) Creation   ii) Insertion   iii) Deletion   iv) Traversal

21. Write C programs that implement stack (its operations) using
    i) Arrays   ii) Pointers

22. Write C programs that implement Queue (its operations) using
    i) Arrays   ii) Pointers

23. Write a C program that implements the following sorting methods to sort a given list of integers in ascending order   i) Bubble sort   ii) Selection sortiii)Insertion sort

24. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:
    i) Linear search   ii) Binary search

TEXT BOOKS:
1. C Programming & Data Structures, B.A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning.
2. Let us C, Yeswanth Kanitkar
3. C Programming, Balaguruswamy.

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ENVIRONMENTAL SCIENCE

B.Tech. I Year I Sem.

L	T	P	C
3	0	0	0

Course Objectives:
- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

Course Outcomes: Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn help in sustainable development.

The students should be able to:
- Know basic concept of ecological perspective and the value of the environment.
- Understand the significance of various natural resources and its management.
- Demonstrate a comprehensive understanding of the world's biodiversity and the importance of its conservation.
- Identify different types of pollution and their control measures, Discover effective methods of waste management and come out with best possible solutions.
- Raise awareness about environmental laws and sustainable development.

COPO MAPPING

CO's	PROGRAM OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		1	2			3	3	2			1	1		
CO2						1	3	2				1		
CO3		2	3			2	2	2				1		
CO4		1	1			3	3	2			1	2		
CO5						2	2	3				2		
AVG		1.3	2.0			2.2	2.6	2.2			1.0	1.4		

UNIT - I
Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT - II
Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT - III
Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

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UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan

(EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

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ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

	L	T	P	C
B.Tech. I Year II Sem.	3	1	0	4

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: To learn
- Methods of solving the differential equations of first and higher order.
- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals

Course out comes: After learning the contents of this paper, the student must be able to
- Identify whether the given differential equation of first order is exact or not.
- Apply the concept of differential equation to real world problems.
- Use the Laplace transforms techniques for solving ODE's.
- Use gradient to evaluate directional derivatives and conservative vector field.
- Calculate the line, surface and volume integrals and converting them from one to another.

COS	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3		1	1							1		
CO2	1	2			2							2		
CO3	3	2		2										
CO4	2	1		2								1		
CO5	2	2										1		
AVG	2.0	2.0		1.7	1.5							1.3		

UNIT-I: First Order ODE   **8 L**
Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT-II: Ordinary Differential Equations of Higher Order   **10 L**
Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax}, $\sin ax$, $\cos ax$, polynomials in x, $e^{ax}V(x)$ and $x\,V(x)$, method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation. Applications: Electric Circuits

UNIT-III: Laplace transforms   **10 L**
Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

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UNIT-IV: Vector Differentiation   **10 L**

Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

UNIT-V: Vector Integration   **10 L**

Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

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ENGINEERING CHEMISTRY

B.Tech. I Year II Sem.

	L	T	P	C
	3	1	0	4

Course Objectives:
1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion it's control to protect the structures.
3. To imbibe the basic concepts of petroleum and its products.
4. To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

Course Outcomes:

At the end of the course, the students will be able to:
1. Apply the principle of potable water for industrial and domestic purposes.
2. Identify the electrolytic and electrochemical cells with different types of batteries and make useof corrosion control methods in industry.
3. Explore the fundamental properties of polymers and other materials in engineering field.
4. Distinguish various types of fuels and their applications in day-to-day life.
5. Develop understanding of engineering materials like cement, smart materials and Lubricants.

COPO MAPPING

CO's	PROGRAM OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2				2	2					2		
CO2	3	2				2	2					3		
CO3	3	2				2	2					2		
CO4	3	2	1				2					3		
CO5	3	2					2					2		
AVG	3.0	2.0	1.0			2.0	2.0					2.4		

UNIT - I: Water and its treatment: [8]
Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation - Determination of F$^-$ ion by ion- selective electrode method.
Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion- exchange processes. Desalination of water – Reverse osmosis.

UNIT – II Battery Chemistry & Corrosion [8]
Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.
Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current methods.

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UNIT - III: Polymeric materials: [8]
Definition – Classification of polymers with examples – Types of polymerization –
addition (free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene
Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, Preparation,
Properties and engineering applications of PVC and Bakelite, Teflon, Fiber reinforced plastics (FRP).
Rubbers: Natural rubber and its vulcanization.
Elastomers: Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokol
rubber.
Conducting polymers: Characteristics and Classification with examples-mechanism of conduction in
trans-polyacetylene and applications of conducting polymers.

Biodegradable polymers: Concept and advantages - Polylactic acid and poly vinyl alcohol and their
applications.

UNIT - IV: Energy Sources: [8]
Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula. Classification- solid fuels: coal –
analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and
its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating,
synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas,
LPG and CNG, Biodiesel – Transesterification, advantages.

UNIT - V: Engineering Materials: [8]
Cement: Portland cement, its composition, setting and hardening.
Smart materials and their engineering applications
Shape memory materials- Poly L- Lactic acid. Thermoresponse materials- Polyacryl amides, Poly vinyl
amides
Lubricants: Classification of lubricants with examples-characteristics of a good lubricants - mechanism
of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point,
pour point, flash point and fire point.

TEXT BOOKS:
1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning,
   2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K.
   Shashikala, Pearson Publications, 2021.
4. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

REFERENCE BOOKS:
1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)

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COMPUTER AIDED ENGINEERING GRAPHICS

B.Tech. I Year II Sem.	**L**	**T**	**P**	**C**
	1	**0**	**4**	**3**

Course Objectives:
- To develop the ability of visualization of different objects through technical drawings
- To acquire computer drafting skill for communication of concepts, ideas in the design of engineering products

Course Outcomes: Using conventional and computer aided drafting tools, the student will be able to:

CO1: Apply the principles of Engineering Graphics to create Engineering Drawings of various geometric constructions, conic sections, curves and scales as per BIS standards.

CO2: Construct orthographic projections for points, lines and planes in different quadrants and Auxiliary views.

CO3: Draw the sectional views and true shape of sections of solids, by applying principles of projections.

CO4: Draw the development of surfaces in real time situations.

CO5: Develop isometric and orthographic views of the objects.

CO's	PROGRAM OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2			2				1	1		1		
CO2	2	2			2				1	1		1		
CO3	2	2			2				1	1		1		
CO4	2	2			2				1	1		1		
CO5	2	2			2				1	1		1		
AVG	2	2			2				1	1		1		

UNIT – I:
Introduction to Engineering Graphics: Principles of Engineering Graphics and their Significance, Scales – Plain & Diagonal, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Introduction to Computer aided drafting – views, commands and conics

UNIT- II:
Orthographic Projections: Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections – points, lines and planes

UNIT – III:
Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views, Computer aided projections of solids – sectional views

UNIT – IV:
Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Development of surfaces using computer aided drafting

UNIT – V:
Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric

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Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa –Conventions. Conversion of orthographic projection into isometric view using computer aided drafting.

TEXT BOOKS:
1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S. Chand and company Ltd.

REFERENCE BOOKS:
1. Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGraw Hill
2. Engineering Graphics and Design, WILEY, Edition 2020
3. Engineering Drawing, M. B. Shah, B.C. Rane / Pearson.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
5. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

Note: - External examination is conducted in conventional mode and internal evaluation to be done by both conventional as well as using computer aided drafting.

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APPLIED MECHANICS

B.Tech. I Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives: The objectives of this course are to

- Explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium
- Perform analysis of bodies lying on rough surfaces.
- Locate the centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections
- Explain kinetics and kinematics of particles, projectiles, curvilinear motion, centroidal motion and plane motion of rigid bodies.
- Explain the concepts of work-energy method and its applications to translation, rotation and plane motion and the concept of vibrations

Course Outcomes: At the end of the course, students will be able to

- Determine resultant of forces acting on a body and analyse equilibrium of a body subjected to a system of forces.
- Solve problem of bodies subjected to friction.
- Find the location of centroid and calculate moment of inertia of a given section.
- Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion.
- Understands about Energy and Momentum Principle.

CO- PO MAPPING

CO's	PROGRAM OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1								1		
CO2	3	3	2	1								1		
CO3	3	3	2	1								1		
CO4	3	3	2	1								1		
CO5	3	3	2	1								1		
AVG	3	3	2	1								1		

UNIT - I
Introduction to Engineering Mechanics - Force Systems: Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy.

UNIT - II
Friction: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, ladder friction
Centroid and Centre of Gravity -Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections; Centre of Gravity and its implications. – Theorem of Pappus.

UNIT - III
Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems

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of moment of inertia, Moment of inertia of standard sections and composite sections; Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem.
Mass Moment of Inertia: Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia – Mass moment of inertia of composite bodies.

UNIT - IV
Kinematics of Particles: Kinematics of particles – Rectilinear motion – Curvilinear motion – Projectiles. Kinetics of Particles: Kinetics of particles – Newton's Second Law – Differential equations of rectilinear and curvilinear motion – Dynamic equilibrium – Inertia force – D. Alembert's Principle applied for rectilinear and curvilinear motion.

UNIT - V
Work - Energy Principle: Equation of translation, principle of conservation of energy, work - energy principle applied to particle motion and connected systems, fixed axis rotation. Impulse – Momentum Principle: Introduction, linear impulse momentum, principle of conservation of linear momentum, elasti impact and types of impact, loss of kinetic energy, co efficient of restitution.

TEXT BOOKS:
1. Shames and Rao (2006), Engineering Mechanics, Pearson Education
2. Reddy Vijay Kumar K. and J. Suresh Kumar (2010), Singer's Engineering Mechanics – Statics & Dynamics

REFERENCE BOOKS:
1. Timoshenko S.P and Young D.H., "Engineering Mechanics", McGraw Hill International Edition, 1983.
2. Andrew Pytel, Jaan Kiusalaas, "Engineering Mechanics", Cengage Learning, 2014.
3. Beer F.P& Johnston E.R Jr. Vector, "Mechanics for Engineers", TMH, 2004.
4. Hibbeler R. C & Ashok Gupta, "Engineering Mechanics", Pearson Education, 2010.
5. Tayal A.K., "Engineering Mechanics – Statics & Dynamics", Umesh Publications, 2011.
6. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University Press, 2008.
7. Meriam. J. L., "Engineering Mechanics", Volume-II Dynamics, John Wiley & Sons, 2008.
8. P.C Dumir et al. "Engineering Mechanics", University press

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SURVEYING

B.Tech. I Year II Sem.

L	T	P	C
2	0	0	2

Course Objectives: The first step in engineering practice is surveying and the soundness of any civil engineering work is dependent on the reliability and accuracy of surveying. Therefore, it is imperative that a student of engineering should have good knowledge of surveying. To impart the knowledge of surveying and latest technologies in surveying it is necessary to introduce this subject in the curriculum.

Course Outcomes: At the end of the course, the student will be able to:
- Calculate angles, distances, and levels
- Do levelling, contouring and computation of areas.
- Understand theodolite surveying and traversing.
- Understand Tacheometric surveying.
- Understand Total Station and GPS System.

CO- PO MAPPING

CO's	PROGRAM OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1			3	1			2	1		2		
CO2	3	1			3	1			2	1		2		
CO3	3	1			3	1			2	1		2		
CO4	3	1			3	1			2	1		2		
CO5	3	1			3	1			2	1		2		
AVG	3	1			3	1			2	1		2		

UNIT - I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.

Measurement of Distances and Directions

Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods- E.D.M. method.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination and dip.

UNIT - II

Levelling and Contouring Leveling- Basics definitions, types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours.

Computation of Areas and Volumes

Areas - Determination of areas consisting of irregular boundary and regular boundary (coordinates, MDM, DMD methods), Planimeter.

Volumes - Computation of areas for level section and two level sections with and without transverse slopes, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.

UNIT - III

Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments,

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measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible.

Traversing: Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.

UNIT - IV
Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry.
Curves: Types of curves and their necessity, elements of simple curve, setting out of simple Curves,

UNIT - V
Modern Surveying Methods: Total Station and Global Positioning System: Basic principles, classifications, applications, comparison with conventional surveying. Electromagnetic wave theory - electromagnetic distance measuring system - principle of working and EDM instruments, Components

of GPS – space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS.

TEXT BOOKS:
1. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi.
2. Chandra A M, "Higher Surveying", New age International Pvt. Ltd., Publishers, New Delhi, 2002.
3. Hoffman. B, H. Lichtenegga and J. Collins, Global Positioning System - Theory and Practice, Springer -Verlag Publishers, 2001.

REFERENCE BOOKS:
1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill – 2000.
2. Arora K R "Surveying Vol 1, 2 & 3), Standard Book House, Delhi, 2004.
3. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.
4. Chandra A M, "Plane Surveying", New Age International Pvt. Ltd., New Delhi, 2002.
5. Surveying by Bhavikatti; Vikas publishing house ltd.
6. Duggal S K, "Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2004.
7. Surveying and leveling by R. Agor Khanna Publishers 2015.

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PYTHON PROGRAMMING LAB

B.Tech. I Year II Sem.   **L T P C**
                                                                  0 1 2 2

Course Objectives:
- To install and run the Python interpreter
- To learn control structures.
- To Understand Lists, Dictionaries in python
- To Handle Strings and Files in Python

Course Outcomes: After completion of the course, the student should be able to
- Develop the application specific codes using python.
- Understand Strings, Lists, Tuples and Dictionaries in Python
- Verify programs using modular approach, file I/O, Python standard library
- Implement Digital Systems using Python

Note: The lab experiments will be like the following experiment examples

Week -1:
1. i) Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
   ii) Start the Python interpreter and type help() to start the online help utility.
2. Start a Python interpreter and use it as a Calculator.
3.
   i) Write a program to calculate compound interest when principal, rate and number of periods are given.
   ii) Given coordinates (x1, y1), (x2, y2) find the distance between two points
4. Read name, address, email and phone number of a person through keyboard and print the details.

Week - 2:
1. Print the below triangle using for loop.
   5
   4 4
   3 3 3
   2 2 2 2
   1 1 1 1 1
2. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character (use 'if-else-if' ladder)
3. Python Program to Print the Fibonacci sequence using while loop
4. Python program to print all prime numbers in a given interval (use break)

Week - 3:
1. i) Write a program to convert a list and tuple into arrays.
   ii) Write a program to find common values between two arrays.
2. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.
3. Write a function called palindrome that takes a string argument and returnsTrue if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

Week - 4:
1. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
2. Write a function called has_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.

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i). Write a function called remove_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.

ii). The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.

iii). Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.

3. i) Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'

ii) Remove the given word in all the places in a string?

iii) Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?

4. Writes a recursive function that generates all binary strings of n-bit length

Week - 5:

1. i) Write a python program that defines a matrix and prints

   ii) Write a python program to perform addition of two square matrices

   iii) Write a python program to perform multiplication of two square matrices

2. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.

3. Use the structure of exception handling all general purpose exceptions.

Week-6:

1. a. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.

   b. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.

   c. Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.

   d. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw_circle that draws circles on the canvas.

2. Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiple levels of Inheritances.

3. Write a python code to read a phone number and email-id from the user and validate it for correctness.

Week- 7

1. Write a Python code to merge two given file contents into a third file.

2. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.

3. Write a Python code to Read text from a text file, find the word with most number of occurrences

4. Write a function that reads a file *file1* and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.

Week - 8:

1. Import numpy, Plotpy and Scipy and explore their functionalities.

2. a) Install NumPy package with pip and explore it.

3. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR

4. Write a program to implement Half Adder, Full Adder, and Parallel Adder

5. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

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TEXT BOOKS:

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

REFERENCE BOOKS:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
3. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
4. Think Python, Allen Downey, Green Tea Press
5. Core Python Programming, W. Chun, Pearson
6. Introduction to Python, Kenneth A. Lambert, Cengage

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ENGINEERING CHEMISTRY LAB

B.Tech. I Year II Sem.

L	T	P	C
0	0	2	1

Course Objectives: The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:
- Estimation of hardness of water to check its suitability for drinking purpose.
- Students are able to perform estimations of acids and bases using conductometry, potentiometry and pH metry methods.
- Students will learn to prepare polymers such as Bakelite and nylon-6 in the laboratory.
- Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

Course Outcomes: The experiments will make the student gain skills on:

1. Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions.
2. Performing experimental methods such as conductometry, potentiometry and pH metry in orderto find out the concentrations or equivalence points of acids and bases.
3. Preparation of polymers like Bakelite and nylon-6.
4. Estimation of saponification value, surface tension and viscosity of lubricant oils.
5. Estimation of different types of qualitative and quantitative measurements of a given compound.

CO's	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		1			2					2		
CO2	2	2					2					2		
CO3	2	2				1	2					2		
CO4	3	2				2	2					2		
CO5	3	2		2								2		
AVG	2.6	2.0		1.5		1.5	2.0					2.0		

List of Experiments:
I. Volumetric Analysis: Estimation of Hardness of water by EDTA Complexometry method.
II. Conductometry: Estimation of the concentration of an acid by Conductometry.
III. Potentiometry: Estimation of the amount of Fe^{+2} by Potentiomentry.
IV. pH Metry: Determination of an acid concentration using pH meter.
V. Preparations:
    1. Preparation of Bakelite.
    2. Preparation Nylon – 6.
VI. Lubricants:
    1. Estimation of acid value of given lubricant oil.
    2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.
VII. Corrosion: Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.
VIII. Virtual lab experiments
    1. Construction of Fuel cell and its working.
    2. Smart materials for Biomedical applications
    3. Batteries for electrical vehicles.

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4. Functioning of solar cell and its applications.

REFERENCE BOOKS:

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

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SURVEYING LABORATORY - I

B.Tech. I Year II Sem.

L	T	P	C
0	0	2	1

Course Objective:
1. Student will be able to learn and understand the various basic concept and principles used in surveying like Chain Surveying, Compass Surveying, Plane Table Surveying, and Levelling Surveying.
2. Student will be able to learn and understand various instrument used in surveying.
3. Student will learn and understand how to calculate Area of plot and Ground.
4. Student will learn and understand about Horizontal Angle, Vertical Angle, Horizontal distance and Vertical distance to study the ground profile.

Course Outcomes: At the end of the course student will be able to:
1. Student will be able to prepare Map and Plan for required site with suitable scale.
2. Student will be able to prepare contour Map and Estimate the Quantity of earthwork required for formation level for Road and Railway Alignment.
3. Student will be able to judge which type of instrument to be used for carrying out survey for a Particular Area and estimate the area.
4. Student will be able to judge the profile of ground by observing the available existing contour map.

CYCLE - I
1. Chaining of a line using chain, measurements of area by cross staff survey.
2. Measurement of distance between two points when there is an obstacle for both chaining and ranging. Compass survey
3. Traversing by compass and adjustments in included angles and measurement of area - graphical adjustments.
4. Distance between two inaccessible points by compass. Plane Table Surveying
5. Measurement & Plotting of the area by Radiation method.
6. Determination of Positions objects by Intersection Method – Plane Table Survey.
7. Traverse by Plane table Survey.

CYCLE – II
Leveling
8. Measurement of elevation of various given points.
9. Elevation difference between two given points by reciprocal leveling.
10. Longitudinal Leveling
11. Cross – section Leveling
12. Plotting of Contours by Indirect Method

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PROBABILITY AND STATISTICS

B.Tech. II Year I Sem.	L	T	P	C
	3	1	0	4

Pre-requisites: Mathematics courses of first year of study.

Course Objectives: To learn
- The theory of Probability, and probability distributions of single and multiple random variables
- The sampling theory and testing of hypothesis and making statistical inferences

Course outcomes: After learning the contents of this paper the student must be able to
- Apply the concepts of probability and distributions to some case studies.
- Correlate the concepts of one unit to the concepts in other units.

UNIT - I: Probability   **8 L**
Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule, Baye's Rule.
Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions.

UNIT - II: Expectation and discrete distributions   **10 L**
Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem.
 Discrete Probability Distributions: Binomial Distribution, Poisson distribution.

UNIT - III: Continuous Distributions and sampling   **10 L**
Uniform Distribution, Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial Distributions.
Fundamental Sampling Distributions: Random Sampling, Some Important Statistics, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, t –Distribution, F-Distribution.

UNIT - IV: Estimation & Tests of Hypotheses   **10 L**
Introduction, Statistical Inference, Classical Methods of Estimation, Single Sample: Estimating the mean, standard error of a point estimate, prediction interval. Two sample: Estimating the difference between two means, Single sample: Estimating a proportion, Two samples: Estimating the difference between two proportions, Two samples: Estimating the ratio of two variances.
Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, Single sample: Tests concerning a single mean, Two samples: tests on two means, One sample: test on a single proportion. Two samples: tests on two proportions, Two- sample tests concerning variances.

UNIT - V: Applied Statistics   **10 L**
Curve fitting by the method of least squares, fitting of straight lines, second degree parabolas and more general curves, Correlation and regression, Rank correlation.

TEXT BOOKS:
1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics for Engineers & Scientists, 9th Ed. Pearson Publishers.
2. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.

REFERENCE BOOKS:
1. T. T. Soong, Fundamentals of Probability and Statistics for Engineers, John Wiley & Sons, Ltd, 2004.
2. Sheldon M Ross, Probability and statistics for Engineers and scientists, academic press.

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BUILDING MATERIALS, CONSTRUCTION AND PLANNING

B.Tech. II Year I Sem.

	L	T	P	C
	3	0	0	3

Course Objectives: The objectives of the course is to
- List the construction material.
- Explain different construction techniques
- Understand the building bye-laws
- Highlight the smart building materials

Course Outcomes: After the completion of the course student should be able to
- Understand the different construction material.
- Understand the different component parts of building and their construction practices and techniques
- Understand the functional requirements to be considered for design and construction of building
- Identify the factors to be considered in planning and construction of buildings
- Plan a building based on the factors and principles of planning.

CO's	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				2	2	2	2	1		2	2		
CO2	3				2	2	2	2	1		2	2		
CO3	3				2	2	2	2	1		2	2		
CO4	3				2	2	2	2	1		2	2		
CO5	3				2	2	2	2	1		2	2		
AVG	3				2	2	2	2	1		2	2		

UNIT - I
Stones and Bricks, Tiles: Building stones – classifications and quarrying – properties – structural requirements – dressing.
Bricks – Composition of Brick earth – manufacture and structural requirements, Fly ash, Ceramics.
Timber, Aluminum, Glass, Paints and Plastics: Wood - structure – types and properties – seasoning – defects; alternate materials for Timber – GI / fiber– reinforced glass bricks, steel & aluminum, Plastics.

UNIT - II
Cement & Admixtures: Ingredients of cement – manufacture – Chemical composition – Hydration - field & lab tests.
Admixtures – mineral & chemical admixtures – uses.

UNIT - III
Building Components: Lintels, Arches, walls, vaults – stair cases – types of floors, types of roofs – flat, curved, trussed; foundations – types; Damp Proof Course; Joinery – doors – windows – materials – types.
Building Services: Plumbing Services: Water Distribution, Sanitary – Lines & Fittings; Ventilations: Functional requirements systems of ventilations. Air-conditioning - Essentials and Types; Acoustics – characteristic – absorption – Acoustic design; Fire protection – Fire Hazards – Classification of fire-resistant materials and constructions

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UNIT - IV

Mortars, Masonry and Finishing's Mortars: Cement Mortar, Brick masonry – types – bonds; Stone masonry – types; Composite masonry – Brick-stone composite; Concrete, Reinforced brick.
Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP.
Form work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

UNIT – V

Building Planning: Classification of buildings ,functional Planning of buildings: Sustainability and concept of Green building, General aspects to consider for planning, bye-laws and regulations, Selection of site for building construction, Principles of planning, Orientation of building and its relation to outside environment

TEXT BOOKS:
1. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications.
2. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015.
3. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.

REFERENCE BOOKS:
1. Building Materials by Duggal, New Age International.
2. Building Materials by P. C. Varghese, PHI.
3. Building Construction by PC Varghese PHI.
4. Construction Technology – Vol – I & II by R. Chubby, Longman UK.
5. Alternate Building Materials and Technology, Jagadish, Venkatarama Reddy and others; New Age Publications.

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ENGINEERING GEOLOGY

		L	**T**	**P**	**C**
B.Tech. II Year I Sem.		3	0	0	3

Course Objectives: The objective of this Course is
- To give the basics knowledge of Geology that is required for constructing various Civil Engineering Structures, basic Geology, Geological Hazardous and Environmental Geology.
- To focus on the core activities of engineering geologists – site characterization and geologic hazard identification and mitigation. Planning and construction of major Civil Engineering projects.

Course Outcomes: At the end of the course, the student will be able to:
- Understand importance of Geology and weathering of Rocks.
- Understand Mineralogy and Petrology.
- Understand Structural Geology.
- Understand about Earthquakes and importance Geophysical Studies.
- Understand Geology Dams, Reservoir and Tunnels.

CO's	PROGRAMME OUTCOMES													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2		2	3	2	2	3		1	1		1		
CO2	2		2	3	2	2	3		1	1		1		
CO3	2		2	3	2	2	3		1	1		1		
CO4	2		2	3	2	2	3		1	1		1		
CO5	2		2	3	2	2	3		1	1		1		
AVG	2		2	3	2	2	3		1	1		1		

UNIT - I
Introduction: Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological draw backs. Importance of Physical geology, Petrology and Structural geology.
Weathering of Rocks: Its effect over the properties of rocks importance of weathering with reference to dams, reservoirs and tunnels weathering of common rock like "Granite"

UNIT - II
Mineralogy: Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite.
Petrology: Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of igneous. Sedimentary and metamorphic rocks. Their distinguishing features, Megascopic and microscopic and microscopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

UNIT - III
Structural Geology: Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints - their important types and case studies. Their

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importance Insitu and drift soils, common types of soils, their origin and occurrence in India, Stabilization of soils. Ground water, Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration.

UNIT - IV

Earth Quakes: Causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides, their causes and effect; measures to be taken to prevent their occurrence.

Importance of Geophysical Studies: Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and geothermal method. Special importance of Electrical resistivity methods, and seismic refraction methods. Improvement of

competence of sites by grouting etc. Fundamental aspects of Rock mechanics and Environmental Geology.

UNIT - V

Geology of Dams, Reservoirs, and Tunnels: Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Factors contributing to the success of a reservoir. Geological factors influencing water Lightness and life of reservoirs - Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (i.e. Tithological, structural and ground water) in tunneling over break and lining in tunnels.

TEXT BOOKS:
1. Engineering Geology by N. Chennakesavulu, McMillan, India Ltd. 2005
2. Engineering Methods by D. Venkat Reddy; Vikas Publishers 2015.
3. Engineering Geology by S K Duggal, H K Pandey Mc Graw Hill Education Pvt Ltd 2014
4. Principles of Engineering Geology by K.V.G.K. Gokhale – B.S publications

REFERENCE BOOKS:
1. F.G. Bell, Fundamental of Engineering B.S. Publications, 2005.
2. Krynine & Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distribution
3. Engineering Geology by Subinoy Gangopadhyay, Oxford university press.
4. Engineering Geology for Civil Engineers – P.C. Varghese PHI

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STRENGTH OF MATERIALS – I

 B.Tech. II Year I Sem.   **L T P C**
                                                                    3 0 0 3

Pre-Requisites: Engineering Mechanics

Course Objectives: The objective of this Course is
- To understand the nature of stresses developed in simple geometries such as bars, cantilevers and beams for various types of simple loads.
- To calculate the elastic deformation occurring in simple members for different types of loading.
- To show the plane stress transformation with a particular coordinate system for different orientation of the plane.
- To know different failure theories adopted in designing of structural members.

Course Outcome: On completion of the course, the student will be able to:
- Describe the concepts and principles, understand the theory of elasticity including strain/displacement and Hooke's law relationships; and perform calculations, related to the strength of structured and mechanical components.
- Recognize various types loads applied on structural components of simple framing geometries and understand the nature of internal stresses that will develop within the components.
- To evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading.
- Analyze various situations involving structural members subjected to plane stresses by application of Mohr's circle of stress.

UNIT – I
Simple Stresses and Strains: Concept of stress and strain- St. Venant's Principle-Stress and Strain Diagram - Elasticity and plasticity – Types of stresses and strains- Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Pure shear and Complementary shear - Elastic modulii, Elastic constants and the relationship between them – Bars of varying section – composite bars – Temperature stresses.
Strain Energy – Resilience – Gradual, sudden, and impact loadings – simple applications.

UNIT – II
Shear Force and Bending Moment: Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported including overhanging beams subjected to point loads, uniformly distributed load, uniformly varying load, couple and combination of these loads – Point of contraflexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III
Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation- Section Modulus Determination of flexural/bending stresses of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.
Shear Stresses: Derivation of formula for shear stress distribution – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle and channel sections.

UNIT – IV
Deflection of Beams: Slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, Uniformly varying load and couple -Mohr's theorems – Moment area method – Application to simple cases.

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Conjugate Beam Method: Introduction – Concept of conjugate beam method - Difference between a real beam and a conjugate beam - Deflections of determinate beams with constant and different moments of inertia.

UNIT – V
Principal Stresses: Introduction – Stresses on an oblique plane of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear –Principal stresses – Mohr's circle of stresses – ellipse of stress - Analytical and graphical solutions.
Theories of Failure: Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Maximum shear stress theory- Strain Energy and Shear Strain Energy Theory (Von Mises Theory).

TEXT BOOKS:
1. Strength of Materials by R. K Rajput, S. Chand & Company Ltd.
2. Mechanics of Materials by Dr. B.C Punmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain
3. Strength of Materials by R. Subramanian, Oxford University Press

REFERENCE BOOKS:
1. Mechanics of material by R.C. Hibbeler, Prentice Hall publications
2. Engineering Mechanics of Solids by Egor P. Popov, Prentice Hall publications
3. Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge Publishers
4. Strength of Materials by R.K. Bansal, Lakshmi Publications House Pvt. Ltd.
5. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition, Universities Presss

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FLUID MECHANICS

B.Tech. II Year I Sem.   **L T P C**
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Course Objectives: The objectives of the course are to
- Introduce the concepts of fluid mechanics useful in Civil Engineering applications.
- Provide a first level exposure to the students to fluid statics, kinematics and dynamics.
- Learn about the application of mass, energy and momentum conservation laws for fluid flows.
- Train and analyses engineering problems involving fluids with a mechanistic perspective is essential for the civil engineering students
- To obtain the velocity and pressure variations in various types of simple flows.
- To prepare a student to build a good fundamental background useful in the application-intensive courses covering hydraulics, hydraulic machinery and hydrology.

Course Outcomes: Upon completion of this course, students should be able to:
- Understand the broad principles of fluid statics, kinematics and dynamics.
- Understand definitions of the basic terms used in fluid mechanics and characteristics of fluids and its flow.
- Understand classifications of fluid flow.
- Be able to apply the continuity, momentum and energy principles.

UNIT – I
Properties of Fluid
Distinction between a fluid and a solid; Properties of fluids – Viscosity, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.
Fluid Statics
Fluid Pressure: Pressure at a point, Pascals law, Hydrostatic law, Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces.

UNIT - II
Fluid Kinematics
Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; One, two- and three-dimensional flows; Streamline, path line, streak line and stream tube; stream function, velocity potential function , flow net , One, two- and three-dimensional continuity equations in Cartesian coordinates applications.
Fluid Dynamics
Surface and Body forces -Euler's and Bernoulli's equation; Momentum equation. correction factors. Bernoulli's equation to real fluid flows.

UNIT - III
Flow Measurement in Pipes
Practical applications of Bernoulli's equation: venturi meter, orifice meter and pitot tube, applications of Momentum equations; Forces exerted by fluid flow on pipe bend, sudden enlargement in pipes.
Flow Over Notches & Weirs
Flow through rectangular; triangular and trapezoidal notches and weirs; End contractions; Velocity of approach. Broad crested weir.
UNIT – IV
Flow through Pipes
Reynolds experiment, Reynolds number, Loss of head through pipes, Darcy-Wiesbatch equation, minor losses, total energy line, hydraulic grade line, Pipes in series, equivalent pipes, pipes in parallel,

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siphon, branching of pipes, three reservoir problem, power transmission through pipes. Analysis of pipe networks: Hardy Cross method and EPA NET, water hammer in pipes and control measures.

UNIT - V
Laminar & Turbulent Flow
Laminar flow through circular pipes, and fixed parallel plates.
Boundary Layer Concepts
Prandtl contribution, Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness concepts of laminar and turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control. Drag and Lift and types of drag, magnus effect.
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TEXT BOOKS:
1. Fluid Mechanics by Modi and Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015.
3. Fluid Mechanics by R.C. Hibbeler, Pearson India Education Services Pvt. Ltd.

REFERENCE BOOKS:
1. Fluid Mechanics – Frank M. White – 8th Edition – Mc Graw Hill Education.
2. *Theory and Applications of Fluid Mechanics, K.Subramanya, Tata McGraw Hill
3. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborthy, Mc Graw Hill Education (India) Private Limited
4. Fluid Mechanics and Machinery,C.S.P. Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
5. Fluid mechanics & Hydraulic Machines, Domkundwar & Domkundwar Dhanpat Rai &Co
6. Fluid Mechanics and Hydraulic Machines, R. K. Bansal, Laxmi Publication Pvt Ltd.

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SURVEYING LABORATORY – II

B.Tech. II Year I Sem.

L T P C
0 0 2 1

Course Objectives:
1. Student will be able to learn and understand the various basic concept and principles used in surveying like Chain Surveying, Compass Surveying, Plane Table Surveying, and Levelling Surveying.
2. Student will be able to learn and understand about theodolite and total station in surveying.
3. Student will learn and understand how to calculate Area of plot and Ground.
4. Student will learn and understand about Horizontal Angle, Vertical Angle, Horizontal distance and Vertical distance to study the ground profile using total station.

Course Outcomes: At the end of the course student will be able to:
1. Prepare Map and Plan for required site with suitable scale.
2. Prepare contour Map and Estimate the Quantity of earthwork required for formation level for Road and Railway Alignment.
3. Judge which type of instrument to be used for carrying out survey for a Particular Area and estimate the area.
4. Judge the profile of ground by observing the available existing contour map.

CYCLE - I
Theodolite surveying:
1. Measurement of horizontal angles and vertical angles.
2. Distance between two inaccessible points.
3. Measurement of area by theodolite traversing (Gales traverse table).
4. Determination of tachometer constants.
5. Distance between two inaccessible points using the principles of tachometer surveying.
6. Distance between two inaccessible points using the principles of trigonometric surveying

CYCLE - II
Total Station:
7. Area Measurement 8. Stake Out
9. Remote Elevation Measurement
10. Missing Line Measurement
11. Longitudinal & Cross Section Profile
12. Contouring
13. Providing a Simple Circular Curve
14. Demonstration using DGPS

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STRENGTH OF MATERIALS LABORATORY

B.Tech. II Year I Sem.   **L   T   P   C**
                                                                            0   0   2   1

Course Objectives:
- To conduct the Tension test, Compression test on various materials
- To conduct the Shear test, Bending test on determinate beams
- To conduct the Compression test on spring and Hardness test using various machines
- To conduct the Torsion test, Impact test on various materials

Course Outcomes: After the completion of the course, students should be able to
- Determine the yield stress, ultimate tensile stress, percentage elongation of steel, compressive strength of brick and concrete
- Determine the ultimate shear stress, modulus of elasticity of steel
- Determine the stiffness of the close coiled helical spring and hardness number of mild steel, brass, copper and aluminium.
- Determine the modulus of rigidity and impact strength of steel.

List of Experiments:
1. Tension test
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on concrete.
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of electrical resistance strain gauges.
12. Continuous beam – deflection test.

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COMPUTER AIDED DRAFTING LABORATORY

B.Tech. II Year I Sem.	L	T	P	C
	0	0	2	1

Course Objectives:
- To be able to plan buildings as per NBC**.**
- To understand various types of conventional signs and brick bonds.
- To draw the plan section and elevation for doors, trusses and staircases.
- To use AutoCAD tools to draw building plans, sections and elevations from a given line diagram and specifications.
- To develop working drawings of residential buildings.

Course Outcomes: After completion of the course, the student should be able to
- Plan buildings as per NBC.
- Use different Commands of selected drafting software to draw Conventional signs and brick bonds, Plan, Section and Elevation of buildings.
- Draw section and elevation of panelled doors and trusses.
- Draw and detail the different components of Stair cases.
- Develop and draw single /two storey residential building and public building as per the building by-laws.
- Draw Electrical layout, Plumbing layout for residential buildings.

List of Experiments:
1. Planning Aspects of Building systems as per National Building Code (NBC).
2. Brick bonds: English bond & Flemish bond – Odd and Even courses.
3. Developing plan and section of dog-legged staircase.
4. Developing plan of single storied residential building.
5. Developing section and elevation of single storied residential building.
6. Developing plan of single /two storied Residential building as per Building by-laws.
7. Developing plan of public building as per building by-laws.
8. Developing section and elevation of public building.
9. Development of working drawing of building –Electrical Layout.
10. Development of working drawing of building – Plumbing Layout.

TEXT BOOKS:
1. Computer Aided Design Laboratory by M. N. Sesha Praksh & Dr. G. S. Servesh –Laxmi Publications.
2. Engineering Graphics by P. J. Sha – S. Chand & Co.
3. Civil Engineering Drawing-I by N. Sreenivasulu, S. Rama Rao – Radiant Publishing House.
4. Civil Engineering Drawing-II by N. Sreenivasulu – Radiant Publishing House.

REFERENCE BOOKS:
1. Engineering Graphics by P. J. Sha - S. Chand & Co
2. Civil Engineering Drawing-I by S. Mahaboob Basha – Falcon Publishers
3. Building drawing by M. G. Shah - Tata McGraw-Hill Education
4. Structural Engineering Drawing by S. Mahaboob Basha – Falcon Publishers

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CONSTITUTION OF INDIA

B.Tech. II Year I Sem.

	L	T	P	C
	3	0	0	0

Course Objectives: Students will be able to:
- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:
- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
- Discuss the passage of the Hindu Code Bill of 1956.

Unit - 1 History of Making of the Indian Constitution- History of Drafting Committee.

Unit - 2 Philosophy of the Indian Constitution- Preamble Salient Features

Unit - 3 Contours of Constitutional Rights & Duties - Fundamental Rights
- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

Unit - 4 Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

Unit - 5 Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Unit - 6 Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested Reading:
1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech. II Year II Sem.

L	T	P	C
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Course Objectives:
- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To import the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.
- To introduce the concepts of diodes & transistors, and
- To impart the knowledge of various configurations, characteristics and applications.

Course Outcomes:
- To analyze and solve electrical circuits using network laws and theorems.
- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations
- To identify and characterize diodes and various types of transistors.

UNIT - I:
D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation.
A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits , Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT - II:
Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

UNIT - III:
Electrical Machines: Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency, Three-phase transformer connections. Construction and working principle of DC generators, EMF equation, working principle of DC motors, Torque equations and Speed control of DC motors, Construction and working principle of Three-phase Induction motor, Torques equations and Speed control of Three-phase induction motor. Construction and working principle of synchronous generators.

UNIT - IV:
P-N Junction and Zener Diode: Principle of Operation Diode equation, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Zener diode characteristics and applications.
Rectifiers and Filters: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters.
UNIT - V:
Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Amplifying Action, Common Emitter, Common Base and Common Collector configurations, Comparison of CE, CB and CC configurations.

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Field Effect Transistor (FET): Construction, Principle of Operation, Comparison of BJT and FET, Biasing FET.

TEXT BOOKS:

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education

REFERENCE BOOKS:

1. Electronic Devices and Circuits – R. L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
7. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
8. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
9. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

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CONCRETE TECHNOLOGY

B.Tech. II Year II Sem.	L	T	P	C
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Pre-Requisites: Building Materials

Course Objectives: The objectives of the course are to
- **Know** different types of cement as per their properties for different field applications.
- **Understand Design** economic concrete mix proportion for different exposure conditions and intended purposes.
- **Know** field and laboratory **tests** on concrete in plastic and hardened stage.

Course Outcomes: After the completion of the course student should be able to
- **Determine** the properties of concrete ingredients i.e., cement, sand, coarse aggregate by conducting different tests. Recognize the effects of the rheology and early age properties of concrete on its long-term behavior.
- **Apply** the use of various chemical admixtures and mineral additives to design cement-based materials with tailor-made properties
- **Use** advanced laboratory techniques to characterize cement-based materials.
- **Perform** mix design and engineering properties of special concretes such as high-performance concrete, self-compacting concrete, and fiber reinforced concrete.

UNIT I
Aggregate: Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine, Manufactured sand and coarse Aggregates – Gap graded aggregate – Maximum aggregate size-Properties Recycled aggregate.

UNIT - II
Fresh Concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing, vibration and revibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

UNIT – III
Hardened Concrete: Water / Cement ratio – Abram's Law – Gel/space ratio – Gain of strength of concrete – Maturity concept – Strength in tension and compression – Factors affecting strength – Relation between compression and tensile strength - Curing.
Testing of Hardened Concrete: Compression tests– Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT.

UNIT - IV
Elasticity, Creep & Shrinkage – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

UNIT – V
Admixtures: Types of admixtures – mineral and chemical admixtures.
Mix Design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

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Special Concretes: Introduction to Light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete, Nano silica and Nano Alumina concrete.

TEXT BOOKS:
1. Concrete Technology by M.S. Shetty. – S. Chand & Co.; 2004
2. Concrete Technology by A.R. Santhakumar, 2nd Edition, Oxford university Press, New Delhi
3. Concrete Technology by M. L. Gambhir. – Tata Mc. Graw Hill Publishers, 5TH Edition,New Delhi

REFERENCE BOOKS:
1. Properties of Concrete by A. M. Neville – Low priced Edition – 4th edition
2. Concrete: Micro structure, Properties and Materials – P.K. Mehta and J.M. Monteiro, Mc-Graw Hill Publishers

IS Codes:
IS 383 : 2016
IS 516 : 2018 (Part -1 - 4)
IS 10262 - 2019

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STRENGTH OF MATERIALS – II

B.Tech. II Year II Sem.

	L	T	P	C
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Pre-Requisites: Strength of Materials - I

Course Objectives: The objective of this Course is
- To understand the nature of stresses developed in simple geometries shafts, springs, columns &cylindrical and spherical shells for various types of simple loads.
- To calculate the stability and elastic deformation occurring in various simple geometries for different types of loading.
- To understand the unsymmetrical bending and shear center importance for equilibrium conditions in a structural member of having different axis of symmetry.

Course Outcome: On completion of the course, the student will be able to:
- Describe the concepts and principles, understand the theory of elasticity, and perform calculations, relative to the strength of structures and mechanical components in particular to torsion and direct compression.
- To evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading.
- Analyze strength and stability of structural members subjected to Direct, and Direct and Bending stresses.
- Understand and evaluate the shear center and unsymmetrical bending.

UNIT – I
Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equation -Assumptions made in the theory of pure torsion – Polar section modulus – Power transmitted by shafts – Combined bending and torsion – Design of shafts according to theories of failure.
Springs: Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel.

UNIT – II
Columns and Struts: Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns- assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory– Long columns subjected to eccentric loading – Secant formula – Empirical formulae —— Rankine – Gordon formula- Straight line formula – Prof. Perry's formula.
BEAM COLUMNS: Laterally loaded struts – subjected to uniformly distributed and concentrated loads.

UNIT - III
Direct and Bending Stresses: Stresses under the combined action of direct loading and bending moment, core of a section – determination of stresses in the case of retaining walls, chimneys and dams – conditions for stability-Overturning and sliding – stresses due to direct loading and bending moment about both axis.

UNIT – IV
Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in diameter, and volume of thin cylinders – Thin spherical shells.
Thick Cylinders: Introduction - Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage.

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UNIT – V
Unsymmetrical Bending:
Introduction – Centroidal principal axes of section –Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis.
Shear Centre: Introduction - Shear center for symmetrical and unsymmetrical (channel, I, T and L) sections.

TEXT BOOKS:
1. Strength of Materials by R.K Rajput, S. Chand & Company Ltd.
2. Mechanics of Materials by Dr. B. C Punmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain
3. Strength of Materials by R. Subramanian, Oxford University Press.

REFERENCE BOOKS:
1. Mechanics of Materials by R.C. Hibbeler, Pearson Education
2. Engineering Mechanics of Solids by Popov E.P. Prentice-Hall Ltd
3. Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge Publishers
4. Strength of Materials by R. K. Bansal, Lakshmi Publications House Pvt. Ltd.
5. Fundamentals of Solid Mechanics by M. L. Gambhir, PHI Learning Pvt. Ltd

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HYDRAULICS AND HYDRAULIC MACHINERY

B.Tech. II Year II Sem.

L	T	P	C
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Course Objectives: The objective of the course is
- To Define the fundamental principles of water conveyance in open channels.
- To Discuss and analyze the open channels in uniform and Non-uniform flow conditions.
- To Study the characteristics of hydroelectric power plant and its components.
- To analyze and design of hydraulic machinery and its modeling.

Course Outcomes: At the end of the course the student will able to
- Apply their knowledge of fluid mechanics in addressing problems in open channels and hydraulic machinery.
- Understand and solve problems in uniform, gradually and rapidly varied flows in open channel in steady state conditions.
- Apply dimensional analysis and to differentiate the model, prototype and similitude conditions for practical problems.
- Get the knowledge on different hydraulic machinery devices and its principles that will be utilized in hydropower development and for other practical usages.

UNIT - I
Open Channel Flow – I: Introduction to Open channel flow-Comparison between open channel flow and pipe flow, Classification of open channel flows, Velocity distribution. Uniform flow – Characteristics of uniform flow, Chezy's, Manning's and Bazin formulae for uniform flow – Factors affecting Manning's Roughness Coefficient. Most economical sections. Computation of Uniform flow, Normal depth.
Critical Flow: Specific energy – critical depth - computation of critical depth – critical, sub critical and super critical flows-Channel transitions.

UNIT - II
Open Channel Flow – II: Non-uniform flow – Gradually Varied Flow - Dynamic equation for G.V.F; Classification of channel bottom slopes – Classification and characteristics of Surface profiles – Computation of water surface profiles by Numerical and Analytical approaches. Direct step method.
Rapidly varied flow: Elements and characteristics (Length and Height) of Hydraulic jump in rectangular channel– Types, applications and location of hydraulic jump, Energy dissipation and other uses – Positive and Negative Surges (Theory only).

UNIT - III
Dimensional Analysis and Hydraulic Similitude: Dimensional homogeneity – Rayleigh's method and Buckingham's π methods – Dimensionless groups. Similitude, Model studies, Types of models. Application of dimensional analysis and model studies to fluid flow problems. Distorted models.
Basics of Turbo Machinery: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, Jet striking centrally and at tip, Velocity triangles at inlet and outlet, expressions for work done and efficiency – Angular.

UNIT - IV
Hydraulic Turbines – I: Elements of a typical Hydropower installation – Heads and efficiencies – Classification of turbines – Pelton wheel – Francis turbine – Kaplan turbine – working, working proportions, velocity diagram, work done and efficiency, hydraulic design. Draft tube – Classification, functions and efficiency.
Hydraulic Turbines – II: Governing of turbines – Surge tanks – Unit and specific turbines – Unit speed – Unit quantity – Unit power – Specific speed – Performance characteristics – Geometric similarity – Cavitation. Selection of turbines.

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UNIT - V

Centrifugal Pumps: Pump installation details – classification – work done – Manometric head – minimum starting speed – losses and efficiencies – specific speed. Multistage pumps – pumps in parallel – performance of pumps – characteristic curves – NPSH – Cavitation.
Reciprocating pumps – Working, discharge, slip indicator diagrams.

TEXT BOOKS:
1. Fluid Mechanics by Modi and Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015
3. Open channel flow by V.T. Chow (McGraw Hill Book Company).

REFERENCE BOOKS:
1. Fluid Mechanics by R. C. Hibbeler, Pearson India Education Services Pvt. Ltd
2. Fluid Mechanic & Fluid Power Engineering by D. S. Kumar (Kataria & Sons Publications Pvt. Ltd.).
3. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborthy, Mc Graw Hill Education (India) Private Limited
4. Hydraulic Machines by Banga& Sharma (Khanna Publishers).

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STRUCTURAL ANALYSIS – I

B.Tech. II Year II Sem.

L	T	P	C
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Pre-Requisites: Strength of Materials – I

Course Objectives: The objective of the course is to
- Differentiate the statically determinate and indeterminate structures.
- To understand the nature of stresses developed in perfect frames and three hinged arches for various types of simple loads
- Analyse the statically indeterminate members such as fixed bars, continuous beams and for various types of loading.
- Understand the energy methods used to derive the equations to solve engineering problems
- Evaluate the Influence on a beam for different static & moving loading positions

Course Outcomes: At the end of the course the student will able to
- An ability to apply knowledge of mathematics, science, and engineering
- Analyse the statically indeterminate bars and continuous beams
- Draw strength behaviour of members for static and dynamic loading.
- Calculate the stiffness parameters in beams and pin jointed trusses.
- Understand the indeterminacy aspects to consider for a total structural system.
- Identify, formulate, and solve engineering problems with real time loading

UNIT – I
Analysis of Perfect Frames: Types of frames- Perfect, Imperfect and Redundant pin jointed plane frames - Analysis of determinate pin jointed plane frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

UNIT – II
Energy Theorems: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's theorem-Unit Load Method - Deflections of simple beams and pin- jointed plane frames - Deflections of statically determinate bent frames.
Three Hinged Arches – Introduction – Types of Arches – Comparison between Three hinged and Two hinged Arches - Linear Arch - Eddy's theorem - Analysis of Three hinged arches - Normal Thrust and radial shear and bending moment - Geometrical properties of parabolic and circular arches - Three hinged parabolic circular archeshaving supports at different levels.

UNIT - III
Propped Cantilever and Fixed Beams: Determination of static and kinematic indeterminacies for beams- Analysis of Propped cantilever and fixed beams, including the beams with different moments of inertia - subjected to uniformly distributed load - point loads - uniformly varying load, couple and combination of loads - Shear force, Bending moment diagrams and elastic curve for Propped Cantilever and Fixed Beams-Deflection of Propped cantilever and fixed beams - effect of sinking of support, effect of rotation of a support.

UNIT – IV
Continuous Beams: Introduction-Continuous beams - Clapeyron's theorem of three moments-Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed-continuous beams with overhang - eeffect of sinking of supports.
Slope Deflection Method: Derivation of slope-deflection equation, application to continuous beams with and without sinking of supports -Determination of static and kinematic indeterminacies for frames - Analysis of Single Bay, Single storey Portal Frames by Slope Deflection Method including Side Sway - Shear force and bending moment diagrams and Elastic curve.

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UNIT – V

Moving Loads and Influence Lines: Introduction maximum SF and BM at a given section and absolute maximum shear force and bending moment due to single concentrated load ,uniformly distributed load longer than the span, uniformly distributed load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length - Definition of influence line for shear force and bending moment - load position for maximum shear forceand maximum bending Moment at a section - Point loads, uniformly distributed load longer than the span, uniformly distributed load shorter than the span.

TEXT BOOKS:
1. Structural Analysis Vol –I & II by V.N. Vazirani and M.M. Ratwani, Khanna Publishers.
2. Structural Analysis Vol I & II by G. S. Pandit and S.P. Gupta, Tata McGraw Hill Education Pvt. Ltd.
3. Structural analysis T. S Thandavamoorthy, Oxford university Press

REFERENCE BOOKS:
1. Structural Analysis by R. C. Hibbeler, Pearson Education
2. Basic Structural Analysis by K.U. Muthu *et al.,* I.K. International Publishing House Pvt. Ltd
3. Mechanics of Structures Vol – I and II by H.J. Shah and S.B. Junnarkar, Charotar Publishing House Pvt. Ltd.
4. Basic Structural Analysis by C. S. Reddy, Tata McGraw Hill Education Pvt. Ltd.
5. Fundamentals of Structural Analysis by M.L. Gamhir, PHI Learning Pvt. Ltd.

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HYDRAULICS AND HYDRAULIC MACHINERY LABORATORY

B.Tech. II Year II Sem.   **L T P C**
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Course Objectives
- To **identify** the behavior of analytical models introduced in lecture to the actual behavior of real fluid flows.
- To **explain** the standard measurement techniques of fluid mechanics and their applications.
- To **illustrate** the students with the components and working principles of the Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
- To **analyze** the laboratory measurements and to document the results in an appropriate format.

Course Outcomes: Students who successfully complete this course will have demonstrated ability to:
- **Describe** the basic measurement techniques of fluid mechanics and its appropriate application.
- **Interpre**t the results obtained in the laboratory for various experiments.
- **Discover** the practical working of Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
- **Compare** the results of analytical models introduced in lecture to the actual behavior of real fluid flows and draw correct and sustainable conclusions.
- Write a technical laboratory report

List of Experiments
1. Verification of Bernoulli's equation
2. Determination of Coefficient of discharge for a small orifice by a constant head method
3. Calibration of Venturimeter / Orifice Meter
4. Calibration of Triangular / Rectangular/Trapezoidal Notch
5. Determination of Minor losses in pipe flow
6. Determination of Friction factor of a pipe line
7. Determination of Energy loss in Hydraulic jump
8. Determination of Manning's and Chezy's constants for Open channel flow.
9. Impact of jet on vanes
10. Performance Characteristics of Pelton wheel turbine
11. Performance Characteristics of Francis turbine
12. Performance characteristics of Keplan Turbine
13. Performance Characteristics of a single stage / multi stage Centrifugal Pump

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Email: Email:info@tkrec.ac.in,deanacademics@tkrec.ac.in

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

B.Tech. II Year II Sem.

L	T	P	C
0	0	2	1

Pre-requisites: Basic Electrical and Electronics Engineering

Course Objectives:
- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To import the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.
- To introduce the concepts of diodes & transistors, and
- To impart the knowledge of various configurations, characteristics and applications.

Course Outcomes:
- To analyze and solve electrical circuits using network laws and theorems.
- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations
- To identify and characterize diodes and various types of transistors.

List of experiments/demonstrations:

PART A: ELECTRICAL
1. Verification of KVL and KCL
2. (i) Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
   (ii) Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star) in a Three Phase Transformer
3. Measurement of Active and Reactive Power in a balanced Three-phase circuit
4. Performance Characteristics of a Separately Excited DC Shunt Motor
5. Performance Characteristics of a Three-phase Induction Motor
6. No-Load Characteristics of a Three-phase Alternator

PART B: ELECTRONICS
1. Study and operation of
   (i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies (iv) CRO.
2. PN Junction diode characteristics
3. Zener diode characteristics and Zener as voltage Regulator
4. Input & Output characteristics of Transistor in CB / CE configuration
5. Full Wave Rectifier with & without filters
6. Input and Output characteristics of FET in CS configuration

TEXT BOOKS:
1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education

REFERENCE BOOKS:
1. Electronic Devices and Circuits – R. L. Boylestead and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.

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4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
7. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
8. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
9. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

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CONCRETE TECHNOLOGY LABORATORY

B.Tech. II Year II Sem.   **L T P C**
                                                                         0 0 2 1

Course Objectives:
1. To know the various procedures to determine the characteristics of cement
2. To understand the test procedures to evaluate the characteristics of aggregates
3. To know the test procedures to find the properties of fresh concrete
4. To understand the test procedures to find mechanical properties of hardened concrete

Course Outcomes: After completion of the course, the student should be able to
1. Perform various tests required to assess the characteristics of cement
2. Test and evaluate the properties of fine and coarse aggregates and determine its suitability for construction
3. Evaluate the fresh and hardened properties of concrete
4. Design the concrete mix for required strength and test its performance characteristics

LIST OF EXERCISES:
1. Tests on Cement:
a) Soundness.
f) Compressive strength.

2. Tests on Aggregates:
a) Specific gravity of fine aggregate.
b) Specific gravity of coarse aggregate.
c) Bulking of fine aggregate.
d) Grading of fine aggregate

3. IS method of mix design of normal concrete as per IS : 10262

4. Tests on Fresh Concrete:
a) Slump cone test.
 b) Compacting factor test.
c) Vee-Bee consistometer test.

5. Tests on Hardened Concrete:
 a) Compressive & Tensile strength tests.
 b) Modulus of elasticity of concrete.
c) Non-destructive testing of concrete.

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REAL TIME RESEARCH PROJECT

	L	T	P	C
B.Tech. II Year II Sem.	0	0	4	2

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GENDER SENSITIZATION LABORATORY

</div>

B.Tech. II Year II Sem.	**L**	**T**	**P**	**C**
	0	0	2	1

COURSE DESCRIPTION

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Objectives of the Course:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Learning Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labor and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

Unit-I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men
- Preparing for Womanhood. Growing up Male. First   lessons in Caste.

Unit – II: GENDER ROLES AND RELATIONS

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Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

Unit – III: GENDER AND LABOUR
Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

Unit – IV: GENDER - BASED VIOLENCE
The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*
Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

Unit – V: GENDER AND CULTURE
Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

Note: **Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.**

> *Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".*

👉 **ESSENTIAL READING**: The Textbook, "*Towards a World of Equals: A Bilingual Textbook on Gender"* written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu **published by Telugu Akademi, Telangana Government in 2015.**

ASSESSMENT AND GRADING:
- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%

Program Educational Objectives (PEO's):

PPEO 1: To prepare students to have good knowledge in the field of English, basic sciences and all basic Civil Engineering subjects.

PEO 1.1.To prepare students to have good knowledge in the field of English and basic sciences.

PEO 1.2.To prepare students to have good knowledge in the field of all basic civil Engineering   Subjects.

PEO 2: The students will be trained in practical skills, communication skills and ethical values by providing industrial internship and workshops.

PEO 2.1.The students will be trained in practical skills, communication skills and ethical values.

PEO 2.2. To fulfill above the students will be provided with industrial internship and workshops.

PEO 3: The students will be motivated to innovate and for continuous learning process by encouraging them to attend seminars, becoming members of professional bodies and preparing them for pursuing higher studies

PEO 3.1 The students will be motivated to innovate.

PEO 3.2 The students will be motivated for continuous learning process.

PEO 3.3 To fulfill above the students will be motivated to attend seminars, becoming members of professional bodies and preparing them for pursuing higher studies..

Programme Outcomes (PO's) :

PO1.Engineering knowledge: Ability to obtain and apply the knowledge of science and engineering essentials in problem solving.

PO2.Problem Analysis: Ability to undertake problem recognition ,formulation and providing ideal solution.

PO3.Design/ development of solutions: An ability to design, implement a computer based system, with desire program to meet the needs of social and environmental considerations.

PO4.Conduct investigations of complex problems: An ability to apply mathematical formulas, algorithmic principles and computational theory to develop a model and design of computer based system.

PO5. Modern tool usage: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

PO6.Engineer and society: An ability to analyze the impact of computing in different organizations, society including the varying policy issues that are taken care off.

PO7.Environment and sustainability: understanding of impact of engineering solutions on the environment and this attains sustainability with responsibility.

PO8.Ethics: An ability to lead a strong professionalism and the ethical values.

PO9.Individual and team work: An ability to function effectively on multidisciplinary environments leads to leadership and member of team work.

PO10. Communication: An ability to communicate effectively in both verbal and written form which enables to prepare well documentation for report writing and a project.

PO11.Project management and finance: Apply project management practices to the launch of new programs, initiatives, products, services, and events relative to the stakeholder needs including – finance.

PO12.Life-long learning: RRecognition of the need for higher studies and inspires to update the latest technologies by the way of life long learning process from time to time.

Program Specific Outcomes: (PSO's):

PSO 1: Ability to plan, analyzes, designs, and executes projects in civil engineering.

PSO 2: Provide sustainable solutions to the civil engineering problems.

Institutes Under

TKR EDUCATIONAL SOCIETY

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TKR College of Engineering and Technology(TKRC)

TKR Institute of Management and Science(TKRB)

TKR College of Pharmacy(TKRP)