

**ACADEMIC REGULATIONS  
COURSE STRUCTURE  
AND  
DETAILED SYLLABUS  
(Choice Based Credit System)**



**Civil Engineering**

**For  
B.TECH. FOUR YEAR DEGREE COURSE**  
(Applicable for batches admitted from 2023-2024)



**SWARNANDHRA  
COLLEGE OF ENGINEERING & TECHNOLOGY  
(AUTONOMOUS)**

**SEETHARAMAPURAM, NARSAPUR-534 280, W.G.DT., A.P.**

## Academic Regulations (R23) for B. Tech (Regular-Full time)

(Effective for the students admitted into I year from the Academic  
Year 2023-24 onwards)

### 1. Award of the Degree

- (a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:
  - (i) Pursues a course of study for not less than four academic years and not more than eight academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Eight years).
  - (ii) Registers for 160 credits and secures all 160 credits.
- (b) **Award of B.Tech. degree with Honors** if he/she fulfils the following:
  - (i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 160 credits.
  - (ii) Registering for Honors is optional.
  - (iii) Honors is to be completed simultaneously with B.Tech. programme.

2. Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled. This clause shall be read along with clause 1 a) i).

### 3. Admissions

Admission to the B. Tech Program shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either based on the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

### 4. Program related terms

**Credit:** A unit by which the course work is measured. It determines the number of hours of instruction required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.

#### Credit Definition:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hrs. Practical (Lab) per week	1 credit

- (a) **Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year.
- (b) **Choice Based Credit System (CBCS):** The CBCS provides a choice for students to select from the prescribed courses.

### 5. Semester/Credits:

- i) A semester comprises 90 working days and an academic year is divided into two semesters.
- ii) The summer term is for eight weeks during summer vacation. Internship/ apprenticeship / work-based vocational education and training can be carried out during the summer term, especially by students who wish to exit after two semesters or four semesters of study.
- iii) Regular courses may also be completed well in advance through MOOCs satisfying prerequisites.

**6. Structure of the Undergraduate Programme**

All courses offered for the undergraduate program (B. Tech.) are broadly classified as follows:

S.No.	Category	Breakup of Credits (Total 160)	Percentage of total credits	AICTE Recommendation (%)
1.	Humanities and Social Science including Management (HM)	13	8 %	8 – 9%
2.	Basic Sciences (BS)	20	13 %	12 - 16%
3.	Engineering Sciences (ES)	23.5	14%	10 – 18%
4.	Professional Core (PC)	54.5	34 %	30 – 36%
5.	Electives – Professional (PE) & Open (OE); Domain Specific Skill Enhancement Courses (SEC)	33	21 %	19 - 23%
6.	Internships & Project work (PR)	16	10 %	8 – 11%
7.	Mandatory Courses (MC)	Non-credit	Non-credit	-

**7. Course Classification:**

All courses offered for the undergraduate programme in Engineering & Technology (B.Tech. degree programmes) are broadly classified as follows:

S. No.	Broad Course Classification	Course Category	Description
1.	Foundation Courses	Foundation courses	Includes Mathematics, Physics and Chemistry; fundamental engineering courses; humanities, social sciences and management courses
2.	Core Courses	Professional Core Courses (PC)	Includes subjects related to the parent discipline/department/branch of Engineering
3.	Elective Courses	Professional Elective Courses (PE)	Includes elective subjects related to the parent discipline/department/ branch of Engineering
		Open Elective Courses (OE)	Elective subjects which include interdisciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering
		Domain specific skill enhancement courses (SEC)	interdisciplinary/job-oriented/domain courses which are relevant to the industry
4.	Project & Internships	Project	B.Tech. Project or Major Project
		Internships	Summer Internships – Community based and Industry Internships; Industry oriented Full Semester Internship
5.	Audit Courses	Mandatory non-credit courses	Covering subjects of developing desired attitude among the learners

**8. Programme Pattern**

- Total duration of the of B. Tech (Regular) Programme is four academic years.
- Each academic year of study is divided into two semesters.
- Minimum number of instruction days in each semester is 90 days.
- There shall be mandatory student induction program for freshers, with a three weeks duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., are included as per the guidelines issued by AICTE.

- v. Health/wellness/yoga/sports and NSS /NCC /Scouts & Guides / Community service activities are made mandatory as credit courses for all the undergraduate students.
- vi. Courses like Environmental Sciences, Indian Constitution, Technical Paper Writing & IPR are offered as non-credit mandatory courses for all the undergraduate students.
- vii. Design Thinking for Innovation & Tinkering Labs are made mandatory as credit courses for all the undergraduate students.
- viii. Increased flexibility for students through an increase in the elective component of the curriculum, with 05 Professional Elective courses and 04 Open Elective courses.
- ix. Professional Elective Courses, include the elective courses relevant to the chosen specialization/branch. Proper choice of professional elective courses can lead to students specializing in emerging areas within the chosen field of study.
- x. A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for B.Tech. Degree with a Minor within the 160 credits by opting for the courses offered through various verticals/tracks under Open Electives.
- xi. While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents similar to courses already pursued.
- xii. A pool of interdisciplinary/job-oriented/domain skill courses which are relevant to the industry are integrated into the curriculum of all disciplines. There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain/interdisciplinary courses and the other shall be a soft skills course.
- xiii. Students shall undergo mandatory summer internships, for a minimum of eight weeks duration at the end of second and third year of the programme. The internship at the end of second year shall be community oriented and industry internship at the end of third year.
- xiv. There shall also be mandatory full internship in the final semester of the programme along with the project work.
- xv. Undergraduate degree with Honors is introduced for the students having good academic record.
- xvi. College takes measures to implement Virtual Labs (<https://www.vlab.co.in>) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.
- xvii. College will assign a faculty advisor/mentor after admission to a group of students from same department to provide guidance in courses registration/career growth/placements/opportunities for higher studies/ GATE/ other competitive exams etc.
- xviii. Preferably 25% of course work for the theory courses in every semester shall be conducted in the blended mode of learning.

## 9. Evaluation Process

The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical courses. Summer Internships shall be evaluated for 50 marks, Full Internship & Project work in final semester shall be evaluated for 200 marks, and mandatory courses with no credits shall be evaluated for 30 mid semester marks.

A student has to secure not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester and end examination marks taken together for the theory, practical, design, drawing subject or project etc. In case of a mandatory course, he/she should secure 40% of the total marks.

### Theory Courses

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
<b>Total</b>	<b>100</b>

- i) For theory subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.
- ii) For practical subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End- Examination.
- iii) If any course contains two different branch subjects, the syllabus shall be written in two parts with 3 units each (Part-A and Part-B) and external examination question paper shall be set with two parts each for 35 marks.
- iv) If any subject is having both theory and practical components, they will be evaluated separately as theory subject and practical subject. However, they will be given same subject code with an extension of 'T' for theory subject and 'L' for practical subject.

(a) **Continuous Internal Evaluation**

- i) For theory subjects, during the semester, there shall be two midterm examinations. Each midterm examination shall be evaluated for 30 marks of which 10 marks for objective paper (20 minutes duration), 15 marks for subjective paper (90 minutes duration) and 5 marks for assignment.
- ii) Objective paper shall contain for 05 short answer questions with 2 marks each or maximum of 20 bits for 10 marks. Subjective paper shall contain 3 either or type questions (totally six questions from 1 to 6) of which student has to answer one from each either-or type of questions. Each question carries 10 marks. The marks obtained in the subjective paper are condensed to 15 marks.

**Note:**

- The objective paper shall be prepared in line with the quality of competitive examinations questions.
  - The subjective paper shall contain 3 either or type questions of equal weightage of 10 marks. Any fraction shall be rounded off to the next higher mark.
  - The objective paper shall be conducted by the respective institution on the day of subjective paper test.
  - Assignments shall be in the form of problems, mini projects, design problems, slip tests, quizzes etc., depending on the course content. It should be continuous assessment throughout the semester and the average marks shall be considered.
- iii) If the student is absent for the mid semester examination, no re-exam shall be conducted and mid semester marks for that examination shall be considered as zero.
  - iv) First midterm examination shall be conducted for I, II units of syllabus with one either or type question from each unit and third either or type question from both the units. The second midterm examination shall be conducted for III, IV and V units with one either or type question from each unit.
    - v) Final mid semester marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

**For Example:**

Marks obtained in first mid: 25

Marks obtained in second mid: 20

Final mid semester Marks:  $(25 \times 0.8) + (20 \times 0.2) = 24$

- vi) If the student is absent for any one midterm examination, the final mid semester marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other.

**For Example:**

Marks obtained in first mid: Absent

Marks obtained in second mid: 25

Final mid semester Marks:  $(25 \times 0.8) + (0 \times 0.2) = 20$

**b) End Examination Evaluation:**

End examination of theory subjects shall have the following pattern:

- i) There shall be 11 questions and all questions are compulsory.
- ii) Question I shall contain 5 compulsory short answer questions for a total of 10marks such that each question carries 2 marks.
- iii) There shall be 1 short answer questions from each unit.
  - a) In each of the questions from 2 to `11`, there shall be either/or type questions of 12 marks each. Student shall answer any one of them.
- iv) The questions from 2 to 11 shall be set by covering one unit of the syllabus for each question.

End examination of theory courses consisting of two parts of different subjects, for Example: Basic Electrical & Electronics Engineering shall have the following pattern:

- i) Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.
- ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1mark.
- iii) In each part, questions from 2 to 4, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
- iv) The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

**Practical Courses**

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
<b>Total</b>	<b>100</b>

- i. For practical courses, there shall be a continuous evaluation during the semester for 30 sessional marks and end examination shall be for 70 marks.
- ii. Day-to-day work in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the record/viva and 15 marks for the internal test.
- iii. The end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and a senior expert in the subject from the same department or expert from other institutions.
  - Procedure: 20 marks
  - Experimental work & Results: 30 marks
  - Viva voce: 20 marks.
- iv. In a practical subject consisting of two parts (Eg: Basic Electrical & Electronics Engineering Lab), the end examination shall be conducted for 70 marks as a single laboratory in 3 hours. Mid semester examination shall be evaluated as above for 30 marks in each part and final mid semester marks shall be arrived by considering the average of marks obtained in two parts.
- c) For the subject having design and/or drawing, such as Engineering Drawing, the distribution of marks shall be 30 for mid semester evaluation and 70 for end examination.

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
<b>Total</b>	<b>100</b>



- i. Day-to-day work shall be evaluated for 15 marks by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm examinations in a semester for duration of 2 hours each for 15 marks with weightage of 80% to better mid marks and 20% for the other. The subjective paper shall contain 3 either or type questions of equal weightage of 5 marks. There shall be no objective paper in mid semester examination. The sum of day-to-day evaluation and the mid semester marks will be the final sessional marks for the subject.
  - ii. The end examination pattern for Engineering Graphics, shall consists of 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the end examination. However, the end examination pattern for other subjects related to design/drawing, multiple branches, etc is mentioned along with the syllabus.
- d) There shall be no external examination for mandatory courses with zero credits. However, attendance shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examinations. In case, the student fails, a reexamination shall be conducted for failed candidates for 30 marks satisfying the conditions mentioned in item 1 & 2 of the regulations.
- e) The laboratory records and mid semester test papers shall be preserved for a minimum of 3 years in the respective institutions as per the University norms and shall be produced to the Committees of the University as and when the same are asked for.

#### **10. Skill oriented Courses**

- i) There shall be five skill-oriented courses offered during III to VII semesters.
- ii) Out of the five skill courses two shall be skill-oriented courses from the same domain. Of the remaining three skill courses, one shall be a soft skill course and the remaining two shall be skill-advanced courses from the same domain/Interdisciplinary/Job oriented.
- iii) The course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the principal.
- iv) The Head of the Department shall identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process. The marks/grades shall be assigned to the students by the above committee based on their performance.
- v) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies or any other accredited bodies. If a student chooses to take a Certificate Course offered by external agencies, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency. A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades.
- vi) The recommended courses offered by external agencies, conversions and appropriate grades/marks are to be approved by the BOS at the beginning of the semester. The principal of the respective college shall forward such proposals to the University for approval.
- vii) If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the Department.

## 11. Massive Open Online Courses (MOOCs):

- a. A Student has to pursue and complete one course compulsorily through MOOCs approved by the University. A student can pursue courses other than core through MOOCs and it is mandatory to complete one course successfully through MOOCs for awarding the degree. A student is not permitted to register and pursue core courses through MOOCs.
- b. A student shall register for the course (Minimum of either 8 weeks or 12 weeks) offered through MOOCs with the approval of Head of the Department. The Head of the Department shall appoint one mentor to monitor the student's progression. The student needs to earn a certificate by passing the exam. The student shall be awarded the credits assigned in the curriculum only by submission of the certificate. Examination fee, if any, will be borne by the student.
- c. Students who have qualified in the proctored examinations conducted through MOOCs platform can apply for credit transfer as specified and are exempted from appearing internal as well as external examination (for the specified equivalent credit course only) conducted by the College.
- d. Necessary amendments in rules and regulations regarding adoption of MOOC courses would be proposed from time to time.

## 12. Credit Transfer Policy

Adoption of MOOCs is mandatory, to enable Blended model of teaching-learning as also envisaged in the NEP 2020. As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the College shall allow up to a maximum of 20% of the total courses being offered in a particular programme i.e., maximum of 32 credits through MOOCs platform.

- i) The University shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses.
- ii) Student registration for the MOOCs shall be only through the respective department of the institution, it is mandatory for the student to share necessary information with the department.
- iii) Credit transfer policy will be applicable to the Professional & Open Elective courses only.
- iv) The concerned department shall identify the courses permitted for credit transfer.
- v) The College shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer.
- vi) The institution shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.
- vii) The university shall ensure no overlap of MOOC exams with that of the university examination schedule. In case of delay in results, the university will re-issue the marks sheet for such students.
- viii) Student pursuing courses under MOOCs shall acquire the required credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.
- ix) The institution shall submit the following to the examination section of the university:
  - a) List of students who have passed MOOC courses in the current semester along with the certificate of completion.
  - b) Undertaking form filled by the students for credit transfer.
- x) The universities shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

**Note:** Students shall be permitted to register for MOOCs offered through online platforms approved by the University from time to time.



### 13. Academic Bank of Credits (ABC)

The University has implemented Academic Bank of Credits (ABC) to promote flexibility in curriculum as per NEP 2020 to

- i. provide option of mobility for learners across the universities of their choice
- ii. provide option to gain the credits through MOOCs from approved digital platforms.
- iii. facilitate award of certificate/diploma/degree in line with the accumulated credits in ABC
- iv. execute Multiple Entry and Exit system with credit count, credit transfer and credit acceptance from students' account.

### 14. Mandatory Internships

**Summer Internships :** Two summer internships either onsite or virtual each with a minimum of 08 weeks duration, done at the end of second and third years, respectively are mandatory. It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Power projects, software MNCs or any industries in the areas of concerned specialization of the Undergraduate program. One of the two summer internships at the end of second year (Community Service Project) shall be society oriented and shall be completed in collaboration with government organizations/NGOs & others. The other internship at the end of third year is Industry Internship and shall be completed in collaboration with Industries. The student shall register for the internship as per course structure after commencement of academic year. The guidelines issued by the APSCHE / University shall be followed for carrying out and evaluation of Community Service Project and Industry Internship.

Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate of successful completion from industry shall be included in the report. The report and the oral presentation shall carry 50% weightage each. It shall be evaluated for 50 external marks. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the University.

**Full Semester Internship and Project work:** In the final semester, the student should mandatorily register and undergo internship (onsite/virtual) and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship.

The project report shall be evaluated with an external examiner. The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner appointed by the College and is evaluated for 140 marks.

The college shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

### 15. Guidelines for offering a Minor

To promote interdisciplinary knowledge among the students, the students admitted into B.Tech. in a major stream/branch are eligible to obtain degree in Minor in another stream.

The Minor program requires the completion of 12 credits in Minor stream chosen.

- i) Two courses for 06 credits related to a Minor are to be pursued compulsorily for the minor degree, but maybe waived for students who have done similar/equivalent courses. If waived for a student, then the student must take an extra elective course in its place. It is recommended that students should complete the compulsory courses (or equivalents) before registering for the electives.
- ii) Electives (minimum of 2 courses) to complete a total of 12 credits.

**Note:** A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for Minor by opting for the courses offered through various verticals/tracks under Open Electives.

### 16. Guidelines for offering Honors

The objective of introducing B.Tech.(Hons.) is to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a specialized area in the UG level. The programme is a best choice for academically excellent students having good academic record and interest towards higher studies and research.

- i. Honors is introduced in the curriculum of all B. Tech. programs offering a major degree and is applicable to all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology.
- ii. A student shall earn additional 15 credits for award of B.Tech.(Honors) degree from same branch/department/discipline registered for major degree. This is in addition to the credits essential for obtaining the Undergraduate degree in Major Discipline (i.e., 160 credits).
- iii. A student is permitted to register for Honors in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to the Honors from V Semester onwards.
- iv. The Principal of the college shall arrange separate class work and timetable of the courses offered under Honors program.
- v. Courses that are used to fulfil the student's primary major may not be double counted towards the Honors. Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Honors.
- vi. Students can complete the courses offered under Honors either in the college or in online platforms like SWAYAM with a minimum duration of 12 weeks for a 3-credit course and 8 weeks duration for a 2-credit course satisfying the criteria for credit mobility. If the courses under Honors are offered in conventional mode, then the teaching and evaluation procedure shall be similar to regular B. Tech courses.
- vii. The attendance for the registered courses under Honors and regular courses offered for Major degree in a semester are to be considered separately.
- viii. A student shall maintain an attendance of 75% in all registered courses under Honors to be eligible for attending semester end examinations.
- ix. **A student registered for Honors shall pass in all subjects that constitute the requirement for the Honors degree program.** No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Honors degree programme.
- x. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
- xi. The Honors will be mentioned in the degree certificate as Bachelor of Technology (Honors) in XYZ. For example, B.Tech. (Honors) in Mechanical Engineering.

**Enrolment into Honors:**

- i) Students of a Department/Discipline are eligible to opt for Honors program offered by the same Department/Discipline
- ii) The enrolment of student into Honors is based on the CGPA obtained in the major degree program. CGPA shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students. Students having 7 CGPA without any backlog subjects will be permitted to register for Honors.
- iii) If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.
- iv) Transfer of credits from Honors to regular B. Tech degree and vice-versa shall not be permitted.
- v) Honors is to be completed simultaneously with a Major degree program.

**Registration for Honors:**

- i. The eligible and interested students shall apply through the HOD of his/her parent department. The whole process should be completed within one week before the start of every semester. Selected students shall be permitted to register the courses under Honors.
- ii. The selected students shall submit their willingness to the principal through his/her parent department offering Honors. The parent department shall maintain the record of student pursuing the Honors.
- iii. The students enrolled in the Honors courses will be monitored continuously. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.
- iv. There is no fee for registration of subjects for Honors program offered in offline at the respective institutions.

**17. Attendance Requirements:**

- i) A student shall be eligible to appear for the external examinations if he/she acquires a minimum of 40% attendance in each subject and 75% of attendance in aggregate of all the subjects. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
- ii) Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.
- iii) A stipulated fee shall be payable towards condonation of shortage of attendance to the University.
- iv) Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
- v) A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester from the date of commencement of class work.
- vi) If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
- vii) If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.
- viii) For induction programme attendance shall be maintained as per AICTE norms.

**18. Promotion Rules:**

The following academic requirements must be satisfied in addition to the attendance requirements mentioned in section 17.

- i. A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per university norms.
- ii. A student will be promoted from II to III year if he/she fulfils the academic requirement of securing 40% of the credits (any *decimal* fraction should be *rounded off* to *lower* digit) up to in the subjects that have been studied up to III semester.
- iii. A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any *decimal* fraction should be *rounded off* to *lower* digit) in the subjects that have been studied up to V semester. And in case a student is detained for want of credits for a particular academic year by ii) & iii) above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V semester or VII semester respectively as the case may be.

- iv. When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

### 18. Grading:

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed: After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

#### Structure of Grading of Academic Performance

Range in which the marks in the subject fall	Grade	Grade points
		Assigned
90 & above	S (Superior)	10
80 - 89	A (Excellent)	9
70 - 79	B (Very Good)	8
60 - 69	C (Good)	7
50 - 59	D (Average)	6
40 - 49	E (Pass)	5
< 40	F (Fail)	0
Absent	Ab (Absent)	0

- i) A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.
- ii) For non-credit audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage. Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA = \sum (C_i \times G_i) / \sum C_i$$

where,  $C_i$  is the number of credits of the  $i^{\text{th}}$  subject and  $G_i$  is the grade point scored by the student in the  $i^{\text{th}}$  course.

The Cumulative Grade Point Average (CGPA) will be computed in the same manner considering all the courses undergone by a student over all the semesters of a program, i.e.,

$$CGPA = \sum (C_i \times S_i) / \sum C_i$$

where " $S_i$ " is the SGPA of the  $i^{\text{th}}$  semester and  $C_i$  is the total number of credits up to that semester.

Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by the letters S, A, B, C, D and F.

### Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he/she shall be placed in one of the following four classes:

Class Awarded	CGPA Secured
First Class with Distinction	$\geq 7.5$
First Class	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 5.0 < 5.5$

#### CGPA to Percentage conversion Formula – $(CGPA - 0.5) \times 10$

## 20. With-holding of Results

If the candidate has any dues not paid to the university or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld in such cases.

## 21. Multiple Entry / Exit Option

### (a) Exit Policy:

The students can choose to exit the four-year programme at the end of first/second/third year.

- i) **UG Certificate in (Field of study/discipline)** - Programme duration: First year (first two semesters) of the undergraduate programme, 40 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.
- ii) **UG Diploma (in Field of study/discipline)** - Programme duration: First two years (first four semesters) of the undergraduate programme, 80 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.
- iii) **Bachelor of Science (in Field of study/discipline) i.e., B.Sc. Engineering in(Field of study/discipline)**-Programme duration: First three years (first six semesters) of the undergraduate programme, 120 credits.

### (b) Entry Policy:

Modalities on multiple entry by the student into the B.Tech. programme will be provided in due course of time.

**Note:** The Universities shall resolve any issues that may arise in the implementation of Multiple Entry and Exit policies from time to time and shall review the policies in the light of periodic changes brought by UGC, AICTE and State government.

## 22. Gap Year Concept:

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship / become entrepreneur are allowed to take a break of one year at any time after II year to pursue full-time entrepreneurship programme/to establish startups. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The principal of the college shall forward such proposals submitted by the students. An evaluation committee constituted by the principal shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not

## 23. Transitory Regulations

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

Candidates who are permitted to avail Gap Year shall be eligible for re-joining into the succeeding year of their B. Tech from the date of commencement of class work, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

**24. Minimum Instruction Days for a Semester:**

The minimum instruction days including exams for each semester shall be 90 days.

**25. Medium of Instruction:**

The medium of instruction of the entire B. Tech undergraduate programme in Engineering & Technology (including examinations and project reports) will be in English only.

**26. Student Transfers:**

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the Universities from time to time.

**27. General Instructions:**

- i. The academic regulations should be read as a whole for purpose of any interpretation.
- ii. Malpractices rules-nature and punishments are appended.
- iii. Where the words “he”, “him”, “his”, occur in the regulations, they also include “she”, “her”, “hers”, respectively.
- iv. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.
- v. The College may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Universities.
- vi. In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Academic Council / Head of the institution is final.

\*\*\* \*\*



## **ACADEMIC REGULATIONS (R23) FOR B.TECH. (LATERAL ENTRY SCHEME)**

*(Effective for the students admitted into II year through Lateral Entry Scheme from the Academic Year 2024-25 onwards)*

### **1. Award of the Degree**

- (a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:
  - (i) Pursues a course of study for not less than three academic years and not more than six academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Six years).
  - (ii) Registers for 120 credits and secures all 120 credits.
- (b) **Award of B.Tech. degree with Honors** if he/she fulfils the following:
  - (i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 120 credits.
  - (ii) Registering for Honors is optional.
  - (iii) Honors is to be completed simultaneously with B.Tech. programme.

### **2. Students, who fail to fulfil the requirement for the award of the degree within six consecutive academic years from the year of admission, shall forfeit their seat.**

### **3. Minimum Academic Requirements**

The following academic requirements have to be satisfied in addition to the requirements mentioned in item no.2

- i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester evaluation and end examination taken together.
- ii. A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to V semester.

And in case if student is already detained for want of credits for particular academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of IV year I semester class work of next year.

### **4. Course Pattern**

- i. The entire course of study is three academic years on semester pattern.
- ii. A student eligible to appear for the end examination in a subject but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.
- iii. When a student is detained due to lack of credits/shortage of attendance the student may be re-admitted when the semester is offered after fulfilment of academic regulations, the student shall be in the academic regulations into which he/she is readmitted.

### **5. All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).**

***B.TECH. - COURSE STRUCTURE – R23***  
**(Applicable from the academic year 2023-24 onwards)**

**INDUCTION PROGRAMME**

<b>S. No.</b>	<b>Category</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	MC	Physical Activities -- Sports, Yoga and Meditation, Plantation	0	0	6	0
2	MC	Career Counselling	2	0	2	0
3	MC	Orientation to all branches -- career options, tools, etc.	3	0	0	0
4	EC	Orientation on admitted Branch -- corresponding labs, tools and platforms	2	0	3	0
5	ES	Proficiency Modules & Productivity Tools	2	1	2	0
6	MC	Assessment on basic aptitude and mathematical skills	2	0	3	0
7	MC	Remedial Training in Foundation Courses	2	1	2	0
8	MC	Human Values & Professional Ethics	3	0	0	0
9	BS	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	2	1	2	0
10	ES	Concepts of Programming	2	0	2	0

## CIVIL ENGINEERING COURSE STRUCTURE

### SEMESTER-I

S.No.	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	BS&H	23BS1T02	Engineering Physics	3	0	0	3	30	70	100
2	BS&H	23BS1T03	Linear Algebra & Calculus	3	0	0	3	30	70	100
3	ES	23EE1T01	Basic Electrical & Electronics Engineering	3	0	0	3	30	70	100
4	ES	23ME1T02	Engineering Graphics	1	0	4	3	30	70	100
5	ES	23CS1T01	Introduction to Programming	3	0	0	3	30	70	100
6	ES	23CS1L02	IT Workshop	0	0	2	1	30	70	100
7	BS&H	23BS1L02	Engineering Physics Lab	0	0	2	1	30	70	100
8	ES	23EE1L01	Electrical & Electronics Engineering Workshop	0	0	3	1.5	30	70	100
9	ES	23CS1L01	Computer Programming Lab	0	0	3	1.5	30	70	100
10	BS&H	23BS1P02	NSS/NCC/Scouts & Guides/Community Service	0	0	1	0.5			
<b>Total</b>				<b>13</b>	<b>00</b>	<b>15</b>	<b>20.5</b>	<b>270</b>	<b>630</b>	<b>900</b>

### SEMESTER-II

S.No	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	BS&H	23HS2T01	Communicative English	2	0	0	2	30	70	100
2	BS&H	23BS2T03	Engineering Chemistry	3	0	0	3	30	70	100
3	BS&H	23BS2T04	Differential Equations & Vector Calculus	3	0	0	3	30	70	100
4	ES	23ME2T01	Basic Civil & Mechanical Engineering	3	0	0	3	30	70	100
5	PC	23ME2T03	Engineering Mechanics	3	0	0	3	30	70	100
6	BS&H	23HS2L01	Communicative English Lab	0	0	2	1	30	70	100
7	BS&H	23BS2L03	Engineering Chemistry Lab	0	0	2	1	30	70	100
8	ES	23ME2L01	Engineering Workshop	0	0	3	1.5	30	70	100
9	PC	23CE2L01	Engineering Mechanics and Building Practices Lab	0	0	3	1.5	30	70	100
10	BS&H	23BS2P01	Health and Wellness, Yoga and Sports	-	-	1	0.5			
<b>Total</b>				<b>14</b>	<b>00</b>	<b>11</b>	<b>19.5</b>	<b>270</b>	<b>630</b>	<b>900</b>

L-LECTURE HOURS, T- TUTORIAL HOURS, P-PRACTICAL HOURS, C-CREDITS,  
IM- INTERNAL MARKS, EM- EXTERNAL MARKS, TM- TOTAL MARKS

**SEMESTER-III**

S.No.	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	BS	23BS3T05	Numerical Techniques And Statistical Methods	3	0	0	3	30	70	100
2	HSMC	23HS3T01	Universal human values – understanding harmony and Ethical human conduct	2	1	0	3	30	70	100
3	ES	23CE3T01	Surveying	3	0	0	3	30	70	100
4	PC	23CE3T02	Strength of Materials	3	0	0	3	30	70	100
5	PC	23CE3T03	Fluid Mechanics	3	0	0	3	30	70	100
6	PC	23CE3L01	Surveying Lab	0	0	3	1.5	30	70	100
7	PC	23CE3L02	Strength of Materials Lab	0	0	3	1.5	30	70	100
8	SEC	23CE3S01	Building Planning and Drawing	0	1	2	2	30	70	100
9	AC	23BS3M01	Environmental Science	2	0	0	-	-	-	-
<b>Total</b>				<b>16</b>	<b>2</b>	<b>8</b>	<b>20</b>	<b>240</b>	<b>560</b>	<b>800</b>

**SEMESTER-IV**

S.No.	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	Management Course	23BM4T01	Managerial Economics and Financial Analysis	2	0	0	2	30	70	100
2	ES	23CE4T01	Engineering Geology	3	0	0	3	30	70	100
3	PC	23CE4T02	Concrete Technology	3	0	0	3	30	70	100
4	PC	23CE4T03	Structural Analysis	3	0	0	3	30	70	100
5	PC	23CE4T04	Hydraulics & Hydraulic Machinery	3	0	0	3	30	70	100
6	PC	23CE4L01	Concrete Technology Lab	0	0	3	1.5	30	70	100
7	PC	23CE4L02	Engineering Geology lab	0	0	3	1.5	30	70	100
8	SEC	23CE4S01	Remote Sensing & Geographical Information Systems	0	1	2	2	30	70	100
9	ES	23CE4Z01	Design Thinking & Innovation	1	0	2	2	30	70	100
10	MC	23CE4M01	Building materials and Construction	3	0	0	-	-	-	-
<b>Total</b>				<b>18</b>	<b>1</b>	<b>10</b>	<b>21</b>	<b>270</b>	<b>630</b>	<b>900</b>
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation										

L-LECTURE HOURS, T- TUTORIAL HOURS, P-PRACTICAL HOURS, C-CREDITS,  
IM- INTERNAL MARKS, EM- EXTERNAL MARKS, TM- TOTAL MARKS

I SEMESTER	L	T	P	C
	3	-	-	3
23BS1T02: ENGINEERING PHYSICS				

**Course Objectives:**

To bridge the gap between the Physics in school at 10+2 level and UG level Engineering courses are designed by identifying the importance of the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors, enlightening the characteristics and applications of lasers and optical fibers.

**Course Outcomes:**

At the end of the course students are able to

**CO1:** Familiarize with the basics of crystals and their structures (**K1**).

**CO2:** Summarize various types of polarization of Dielectrics and classify the Magnetic materials (**K2**).

**CO3:** Explain fundamentals of Quantum mechanics and apply it to one dimensional motion of particles (**K3**).

**CO4:** Identify the type of Semiconductor using Hall Effect (**K2**).

**CO5:** Describe the characteristics of Lasers and properties of Optical fibers and their applications (**K2**)

**Syllabus:****UNIT I Crystallography and X-ray diffraction**

**Crystallography:** Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC

**X - ray diffraction:** Miller indices – separation between successive (h k l) planes. Bragg's law- X-ray Diffractometer – crystal structure determination by Laue and powder methods

**UNIT II Dielectric and Magnetic Materials**

**Dielectric Materials:** Introduction - Dielectric polarization – Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation.

**Magnetic Materials:** Introduction - Magnetic dipole moment - Magnetization Magnetic susceptibility and permeability – Atomic origin of magnetism -Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

**UNIT III Quantum Mechanics and Free electron Theory**

**Quantum Mechanics:** Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

**Free Electron Theory:** Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution-Density of states - Fermi energy.

#### **UNIT IV Semiconductors**

**Semiconductors:** Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents –Einstein's equation – Hall effect and its applications.

#### **UNIT V Lasers and Optical Fibers**

**Lasers:** Introduction– Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion - Three level and four level laser pumping schemes - Ruby laser – Helium-Neon laser- Applications of Laser.

**Optical Fibers:** Introduction to Optical fibers- Critical angle of propagation- Total internal reflection- Acceptance angle and acceptance cone- Numerical aperture Classification of optical fibers based on refractive index profile-Classification of optical fibers based on modes- Attenuation in optical fibers and Applications of optical fibers.

#### **Text books:**

1. A Text book of Engineering Physics, M. N. Avadhanulu, P.G.Kshirsagar & TVS ArunMurthy, S. Chand Publications, 11th Edition 2019.
2. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

#### **Reference Books:**

1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning 2021.
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
3. Engineering Physics” - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.2010
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

#### **Web Resources:**

1. <https://www.loc.gov/rr/scitech/selected-internet/physics.html>



I SEMESTER	L	T	P	C
	3	-	-	3
23BS1T03: LINEAR ALGEBRA & CALCULUS				

**Course Objectives:**

To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

**Course Outcomes:**

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

**CO1:** Solve a given system of linear equations (**K2**)

**CO2:** Develop the matrix algebra techniques that are needed by engineers for practical applications (**K4**)

**CO3:** Utilize mean value theorems for real life problems (**K2**)

**CO4:** Apply the concept of partial differentiation in various engineering applications (**K3**)

**CO5:** Evaluate double, triple integrals and their applications (**K3**)

**Syllabus:****UNIT I: Matrices**

Linear Transformation-Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method, System of linear equations: Consistency of System of Linear Equations–Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

**UNIT II: Eigenvalues, Eigenvectors 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 Quadratic form to canonical forms by Orthogonal Transformation.

**UNIT III: Calculus**

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

**UNIT IV: Partial differentiation and Applications (Multi variable calculus)**

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

**UNIT V: Multiple Integrals (Multi variable Calculus)**

Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

**Text book:**

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition

**Reference Book:**

1. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

I SEMESTER	L	T	P	C
	3	-	-	3
<b>23EE1T01: BASIC ELECTRICAL &amp; ELECTRONICS ENGINEERING</b>				

### PART – A BASIC ELECTRICAL ENGINEERING

#### Course Objectives:

To expose to the field of electrical & electronics engineering, laws and principles of electrical/electronic engineering and to acquire fundamental knowledge in the relevant field)

#### Course Outcomes:

After the completion of the course students will be able to

**CO1:** Describe fundamental laws, operating principles of motors/generators, MC/MI Instruments (**K2**)

**CO2:** Demonstrate the working of electrical machines, measuring instruments and power generation stations (**K2**).

**CO3:** Apply mathematical tools and fundamental concepts to derive various equations related to Electrical circuits and machines. (**K3**)

**CO4:** Calculate electrical load and electricity bill of residential and commercial buildings (**K3**).

#### Syllabus:

#### UNIT I : DC & AC CIRCUITS

**DC Circuits:** Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

**AC Circuits:** A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

#### UNIT II: MACHINES AND MEASURING INSTRUMENTS

**Machines:** Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

**Measuring Instruments:** Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wattmeter.

#### UNIT III : ENERGY RESOURCES, ELECTRICITY BILL & SAFETY MEASURES

**Energy Resources:** Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

**Electricity bill:** Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of —unit used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

**Equipment Safety Measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

**Text books:**

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition.
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013.
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition.

**Reference Books:**

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, McGraw Hill, 2019, Fourth Edition.
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020.
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017.
4. Basic Electrical and Electronics Engineering, S. K. Bhattacharya, Person Publications, 2018, Second Edition.

**PART – B**  
**BASIC ELECTRONICS ENGINEERING**

**Course Objectives:**

To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics

**Course Outcomes:**

After the completion of the course students will be able to

**CO1:** Describe the characteristics of various semiconductor devices (**K2**)

**CO2:** Construct voltage regulators and rectifiers (**K2**)

**CO3:** Explain about the amplifiers and instrumentation system (**K2**)

**CO4:** Explain the behavior of combinational and sequential circuits (**K2**)

**Syllabus:**

**UNIT I: SEMI CONDUCTOR DEVICES**

Introduction - Introduction to Electronics, characteristics of PN Junction Diode, Zener Diode — Zener break down and its Characteristics, LED and its characteristics Transistors — BJT- CB, CE, CC Configurations and Characteristics, FET-Characteristics, Transistor acts as Amplifier.

**UNIT II: BASIC ELECTRONIC CIRCUITS AND INSTRUMENTATION**

**Rectifiers and power supplies:** Block diagram description of a dc power supply, working of rectifiers (HW, FW & Bridge), capacitor filter (no analysis), working of simple zener voltage regulator. **Amplifiers:** Block diagram of Public Address system, Circuit diagram and working of RC coupled amplifier with its frequency response. (no analysis) **Electronic Instrumentation:** Block diagram of an electronic instrumentation system.

**UNIT III: DIGITAL ELECTRONICS**

**Number Systems & Logic Gates:** Overview of Number Systems, Logic gates NOT, OR, AND, NOR, NAND, XOR, XNOR Truth Tables and Functionality, BCD codes, Excess 3 code, Graycode.

**Boolean Algebra:** Basic Theorems and properties of Boolean Algebra, Simple combinational circuits— Half and Full Adders & Half and Full Subtractor. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

**Textbooks:**

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009.

**Reference Books:**

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

I SEMESTER	L	T	P	C
	1	-	4	3
23ME1T02: ENGINEERING GRAPHICS				

**Course Objectives:**

To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing

1. To impart knowledge on the projection of points, lines and plane surfaces
2. To improve the visualization skills for better understanding of projection of solids
3. To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
4. To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

**Course Outcomes:**

- CO1:** Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections. **(K2)**
- CO2:** Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views. **(K2)**
- CO3:** Understand and draw projection of solids in various positions in first quadrant. **(K2)**
- CO4:** Explain principles behind development of surfaces. **(K2)**
- CO5:** Prepare isometric and perspective sections of simple solids. **(K2)**

**Syllabus:****UNIT I**

**Introduction:** Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

**Curves:** construction of ellipse, parabola and hyperbola by general, Cycloids, Involute, Normal and tangent to Curves.

**Scales:** Plain scales and diagonal scales.

**UNIT II**

**Orthographic Projections:** Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants

**Projections of Straight Lines:** Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes.

**Projections of Planes:** regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

**UNIT III**

**Projections of Solids:** Types of solids: Polyhedra and Solids of revolution.

Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.



#### **UNIT IV**

**Sections of Solids:** Sections of solids in simple position only.

**Development of Surfaces:** Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

#### **UNIT V**

**Conversion of Views:** Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

**Computer graphics:** Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (Not for end examination)

#### **Text book:**

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

#### **Reference Books:**

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc, 2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

I SEMESTER	L	T	P	C
	3	-	-	3
<b>23CS1T01: INTRODUCTION TO PROGRAMMING</b>				

**Course Objectives:**

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects.

**Course Outcomes:**

A student after completion of the course will be able to

**CO1:** Understand basics of computers, the concept of algorithm and algorithmic thinking **(K2)**

**CO2:** Analyse a problem and develop an algorithm to solve it. **(K3)**

**CO3:** Implement various algorithms using the C programming language. **(K3)**

**CO4:** Understand more advanced features of C language. **(K2)**

**CO5:** Develop problem-solving skills and the ability to debug and optimize the code. **(K3)**

**Syllabus:****UNIT I Introduction to Programming and Problem Solving**

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operators, Type Conversion, and Casting.

**Problem solving techniques:** Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

**UNIT II Control Structures**

Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do while) Break, Continue, goto and exit.

**UNIT III Arrays and Strings**

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings- String Handling Functions.

**UNIT IV Pointers & User Defined Data types**

Pointers-Declaration, Initialization and Accessing , Pointer Arithmetic, Dynamic memory Allocation, array manipulation using pointers, User-defined data types-Structures and Unions.

**UNIT V Functions & File Handling**

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling- Types of File, File Modes, File Accessing functions.

**Note:** The syllabus is designed with C Language as the fundamental language of implementation.

**Textbooks:**

1. Programming in ANSI C by E. Balguruswamy, Tata Mc-Graw Hill
2. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall, 1988.
3. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996.

**Reference Books:**

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition

I SEMESTER	L	T	P	C
	-	-	2	1
23CS1L02: IT WORKSHOP				

**Course Outcomes:**

A student after completion of the course will be able to

**CO1:** Perform Hardware troubleshooting. **(K3)**

**CO2:** Understand Hardware components and inter dependencies. **(K2)**

**CO3:** Safeguard computer systems from viruses/worms. **(K3)**

**CO4:** Prepare Document/ Presentation. **(K3)**

**CO5:** Perform calculations using spreadsheets. **(K3)**

**PC Hardware & Software Installation**

**Task 1:** Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

**Task 2:** Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

**Task 3:** Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

**Task 4:** Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

**Task 5:** Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

**Internet & World Wide Web**

**Task1:** Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

**Task 2:** Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

**Task 3:** Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

**Task 4:** Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

## **LaTeX and WORD**

**Task 1 – Word Orientation:** The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

**Task 2:** Using La TeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word.

**Task 3:** Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

**Task 4:** Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

## **EXCEL**

**Excel Orientation:** The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

**Task 1:** Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

**Task 2:** Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

## **LOOKUP/VLOOKUP**

**Task 3:** Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

## **POWER POINT**

**Task 1:** Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

**Task 2:** Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

**Task 3:** Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

### **AI TOOLS – ChatGPT**

**Task 1:** Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

- Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

**Task 2:** Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

- Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

**Task 3:** Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

- Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

### **Reference Books:**

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2<sup>nd</sup> edition
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3<sup>rd</sup> edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3<sup>rd</sup> edition.



I SEMESTER	L	T	P	C
	-	-	2	1
23BS1L02: ENGINEERING PHYSICS LAB				

**Course Outcomes:**

A student after completion of the course will be able to

- CO1:** Estimate the wave lengths of Laser source using diffraction grating (**K2**).
- CO2:** Plot the intensity of the magnetic field of circular coil carrying current with distance (**K2**).
- CO3:** Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively (**K2**).
- CO4:** Calculate the band gap of a given semiconductor (**K3**).
- CO5:** Evaluate general and mechanical properties of materials (**K2**)

**List of Experiments:**

1. Determination of wave length of Laser light using diffraction grating.
2. Estimation of Planck's constant using photo electric effect.
3. Determination of energy gap of a semiconductor using p-n junction diode.
4. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
5. Determination of temperature coefficients of a thermistor.
6. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.
7. Determination of Numerical aperture and Acceptance angle of a given optical fiber.
8. Determination of the resistivity of semiconductor by four probe method.
9. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
10. Determination of Frequency of AC supply using sonometre
11. Determination of time constant of CR circuit
12. Study of Characteristic curves (I/V) of a Zener diode to determine its Breakdown voltage.

**Note:** Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode.

**References:**

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

**Web Resources**

1. [www.vlab.co.in](http://www.vlab.co.in)
2. <https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype>

I SEMESTER	L	T	P	C
	-	-	3	1.5
<b>23EE1L01: ELECTRICAL &amp; ELECTRONICS ENGINEERING WORKSHOP</b>				

**Course Outcomes:**

After completion of this course, the student will be able to

**CO1.** Measure voltage, current and power in an electrical circuit. **(K3)**

**CO2.** Measure of Resistance using Wheat stone bridge **(K4)**

**CO3.** Discover critical field resistance and critical speed of DC shunt generators. **(K4)**

**CO4.** Investigate the effect of reactive power and power factor in electrical loads. **(K5)**

**Activities:**

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
  - a. Provide some exercises so that hardware tools and instruments are learned to be used by the students.
2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
  - a. Provide some exercises so that measuring instruments are learned to be used by the students.
3. Components:
  - a. Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
  - b. Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

**PART A: ELECTRICAL ENGINEERING LAB****List of experiments:**

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

**Reference Books:**

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition .

**Note:** Minimum Six Experiments to be performed.

## **PART B: ELECTRONICS ENGINEERING LAB**

### **Course Objectives:**

To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

### **Course Outcomes:**

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

**CO1:** Identify & testing of various electronic components. **(K2)**

**CO2:** Understand the usage of electronic measuring instruments. **(K2)**

**CO3:** Plot and discuss the characteristics of various electron devices. **(K2)**

**CO4:** Explain the operation of a digital circuit. **(K2)**

### **List of Experiments:**

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R, J-K&D flip flops using respective ICs.

**Tools/Equipment Required:** Dc Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

### **References:**

1. R.L Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R.P Jain, Modern Digital Electronics, 4<sup>th</sup> Edition, Tata Mc Graw Hill, 2009.
3. R.T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

**Note:** Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

I SEMESTER	L	T	P	C
	-	-	3	1.5
<b>23CS1L01: COMPUTER PROGRAMMING LAB</b>				

**Course Outcomes:**

After completion of this course, the student will be able to

**CO1:** Read, understand, and trace the execution of programs written in C language. **(K2)**

**CO2:** Select the right control structure for solving the problem. **(K3)**

**CO3:** Develop C programs which utilize memory efficiently using programming constructs like pointers. **(K3)**

**CO4:** Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C. **(K3)**

**UNIT I****WEEK 1**

**Objective:** Getting familiar with the programming environment on the computer and writing the first program.

**Suggested Experiments/Activities:**

**Tutorial 1:** Problem-solving using Computers.

**Lab1:** Familiarization with programming environment

- Basic Linux environment and its editors like Vi, Vim & Emacs etc.
- Exposure to Turbo C, gcc
- Writing simple programs using printf(), scanf()

**WEEK 2**

**Objective:** Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

**Suggested Experiments /Activities:**

**Tutorial 2:** Problem-solving using Algorithms and Flow charts.

**Lab 1:** Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

- Sum and average of 3 numbers
- Conversion of Fahrenheit to Celsius and vice versa
- Simple interest calculation

**WEEK 3**

**Objective:** Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

**Suggested Experiments/Activities:**

**Tutorial 3:** Variable types and type conversions:

**Lab 3:** Simple computational problems using arithmetic expressions.

- Finding the square root of a given number
- Finding compound interest
- Area of a triangle using heron's formulae
- Distance travelled by an object

## UNIT II

### WEEK 4

**Objective:** Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

**Suggested Experiments/Activities:**

**Tutorial 4:** Operators and the precedence and as associativity:

**Lab4:** Simple computational problems using the operator' precedence and associativity

- i) Evaluate the following expressions.
  - a.  $A+B*C+(D*E) + F*G$
  - b.  $A/B*C-B+A*D/3$
  - c.  $A+++B---A$
  - d.  $J= (i++) + (++i)$
- ii) Find the maximum of three numbers using conditional operator
- iii) Take marks of 5 subjects in integers, and find the total, average in float

### WEEK 5

**Objective:** Explore the full scope of different variants of “if construct” namely if-else, null else, if-else if\*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for “if construct”.

**Suggested Experiments/Activities:**

**Tutorial 5:** Branching and logical expressions:

**Lab 5:** Problems involving if-then-else structures.

- i) Write a C program to find the max and min of four numbers using if-else.
- ii) Write a C program to generate electricity bill.
- iii) Find the roots of the quadratic equation.
- iv) Write a C program to simulate a calculator using switch case.
- v) Write a C program to find the given year is a leap year or not.

### WEEK 6

**Objective:** Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

**Suggested Experiments/Activities:**

**Tutorial 6:** Loops, while and for loops

**Lab 6:** Iterative problems e.g., the sum of series

- i) Find the factorial of given number using any loop.
- ii) Find the given number is a prime or not.
- iii) Compute sine and cos series
- iv) Checking a number palindrome
- v) Construct a pyramid of numbers.

### UNIT III

#### WEEK 7:

**Objective:** Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

**Suggested Experiments/Activities:**

**Tutorial 7:** 1 D Arrays: searching.

**Lab 7:** 1D Array manipulation, linear search

- i) Find the min and max of a 1-D integer array.
- ii) Perform linear search on 1D array.
- iii) The reverse of a 1D integer array
- iv) Find 2's complement of the given binary number.
- v) Eliminate duplicate elements in an array.

#### WEEK 8:

**Objective:** Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

**Suggested Experiments/Activities:**

**Tutorial 8:** 2 D arrays, sorting and Strings.

**Lab 8:** Matrix problems, String operations, Bubble sort

- i) Addition of two matrices
- ii) Multiplication two matrices
- iii) Sort array elements using bubble sort
- iv) Concatenate two strings without built-in functions
- v) Reverse a string using built-in and without built-in string functions

### UNIT IV

#### WEEK 9:

**Objective:** Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

**Suggested Experiments/Activities:**

**Tutorial 9:** Pointers, structures and dynamic memory

**Lab 9:** Pointers and structures, memory dereference.

- i) Write a C program to find the sum of a 1D array using malloc()
- ii) Write a C program to find the total, average of n students using structures
- iii) Enter n students data using calloc() and display failed students list
- iv) Read student name and marks from the command line and display the student details along with the total.
- v) Write a C program to implement realloc()

## **WEEK 10:**

**Objective:** Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

### **Suggested Experiments/Activities:**

**Tutorial 10:** Bitfields, Self-Referential Structures, Linked lists

**Lab10:** Bitfields, linked lists Read and print a date using dd/mm/yyyy format using bit fields and differentiate the same without using bit- fields

- i) Create and display a singly linked list using self-referential structure.
- ii) Demonstrate the differences between structures and unions using a C program.
- iii) Write a C program to shift/rotate using bitfields.
- iv) Write a C program to copy one structure variable to another structure of the same type.

## **UNIT V**

### **WEEK 11:**

**Objective:** Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

### **Suggested Experiments/Activities:**

**Tutorial 11:** Functions, call by value, scope and extent,

**Lab 11:** Simple functions using call by value, solving differential equations using Eulers theorem.

- i) Write a C function to calculate NCR value.
- ii) Write a C function to find the length of a string.
- iii) Write a C function to transpose of a matrix.
- iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

### **WEEK 12:**

**Objective:** Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

### **Suggested Experiments/Activities:**

**Tutorial 12:** Recursion, the structure of recursive calls

**Lab 12:** Recursive functions

- i) Write a recursive function to generate Fibonacci series.
- ii) Write a recursive function to find the lcm of two numbers.
- iii) Write a recursive function to find the factorial of a number.
- iv) Write a C Program to implement Ackermann function using recursion.
- v) Write a recursive function to find the sum of series.

### **WEEK 13:**

**Objective:** Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

### **Suggested Experiments/Activities:**

**Tutorial 13:** Call by reference, dangling pointers

**Lab 13:** Simple functions using Call by reference, Dangling pointers.

- i) Write a C program to swap two numbers using call by reference.
- ii) Demonstrate Dangling pointer problem using a C program.
- iii) Write a C program to copy one string into another using pointer.



- iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

#### **WEEK14:**

**Objective:** To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

#### **Suggested Experiments/Activities:**

**Tutorial 14:** File handling

**Lab 14:** File operations

- i) Write a C program to write and read text into a file.
- ii) Write a C program to write and read text into a binary file using fread() and fwrite()
- iii) Copy the contents of one file to another file.
- iv) Write a C program to merge two files into the third file using command-line arguments.
- v) Find no. of lines, words and characters in a file
- vi) Write a C program to print last n characters of a given file.

#### **Textbooks:**

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw Hill

#### **Reference Books:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice- Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

I SEMESTER	L	T	P	C
	-	-	1	0.5
<b>23BS1P02: NSS/NCC/SCOUTS &amp; GUIDES/ COMMUNITY SERVICE</b>				

**Course Outcomes:**

After completion of the course the students will be able to

- CO1:** Understand the importance of discipline, character and service motto.(K2)
- CO2:** Solve some societal issues by applying acquired knowledge, facts, and techniques.(K3)
- CO3:** Explore human relationships by analyzing social problems.(K3)
- CO4:** Determine to extend their help for the fellow beings and downtrodden people.(K3)
- CO5:** Develop leadership skills and civic responsibilities.(K3)

**UNIT I: Orientation**

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

**Activities:**

- i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
- ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
- iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
- iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

**UNIT II: Nature & Care****Activities:**

- i) Best out of waste competition.
- ii) Poster and signs making competition to spread environmental awareness.
- iii) Recycling and environmental pollution article writing competition.
- iv) Organising Zero-waste day.
- v) Digital Environmental awareness activity via various social media platforms.
- vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
- vii) Write a summary on any book related to environmental issues.

**UNIT III: Community Service****Activities:**

- i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities experts- etc.
- ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS, iii)Conducting consumer Awareness. Explaining various legal provisions etc.
- iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
- v) Any other programmes in collaboration with local charities, NGOs etc.

### Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme* Vol. I, VidyaKutir Publication, 2021 ( ISBN 978-81-952368-8-6)
2. *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., “Introduction to Environmental Engineering”, McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. “Introduction to Environmental Engineering and Science”, Pearson Education, New Delhi. 2/e 2007 5. Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

### General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

### Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

II SEMESTER	L	T	P	C
	2	-	-	2
23HS2T01: COMMUNICATIVE ENGLISH				

**Course Objectives:**

The main objective of introducing this course, *Communicative English*, is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

**Course Outcomes:**

After completion of the course the students will be able to

**CO1:** Understand the context, topic, and pieces of specific information from social or Transactional dialogues. **(K2)**

**CO2:** Apply grammatical structures to formulate sentences and correct word forms. **(K3)**

**CO3:** Analyze discourse markers to speak clearly on a specific topic in informal discussions. **(K4)**

**CO4:** Evaluate reading / listening texts and to write summaries based on global comprehension of these texts. **(K5)**

**CO5:** Create a coherent paragraph, essay, and resume. **(K6)**

**Syllabus:****UNIT I**

**Lesson: HUMAN VALUES: Gift of Magi (Short Story)**

**Listening:** Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

**Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

**Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information.

**Writing:** Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.

**Grammar:** Parts of Speech, Basic Sentence Structures-forming questions

**Vocabulary:** Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

**UNIT II**

**Lesson: NATURE: The Brook by Alfred Tennyson (Poem)**

**Listening:** Answering a series of questions about main ideas and supporting ideas after listening to audio texts.

**Speaking:** Discussion in pairs/small groups on specific topics followed by short structure talks.

**Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

**Writing:** Structure of a paragraph - Paragraph writing (specific topics)

**Grammar:** Cohesive devices - linkers, use of articles and zero article; prepositions.

**Vocabulary:** Homonyms, Homophones, Homographs.

### UNIT III

#### **Lesson: BIOGRAPHY: Elon Musk**

**Listening:** Listening for global comprehension and summarizing what is listened to.

**Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed

**Reading:** Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.

**Writing:** Summarizing, Note-making, paraphrasing

**Grammar:** Verbs - tenses; subject-verb agreement; Compound words, Collocations

**Vocabulary:** Compound words, Collocations

### UNIT IV

#### **Lesson: INSPIRATION: The Toys of Peace by Saki**

**Listening:** Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

**Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

**Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.

**Writing:** Letter Writing: Official Letters, Resumes

**Grammar:** Reporting verbs, Direct & Indirect speech, Active & Passive Voice

**Vocabulary:** Words often confused, Jargons

### UNIT V

#### **Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)**

**Listening:** Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

**Speaking:** Formal oral presentations on topics from academic contexts

**Reading:** Reading comprehension.

**Writing:** Writing structured essays on specific topics.

**Grammar:** Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

**Vocabulary:** Technical Jargons

#### **Textbooks:**

1. Pathfinder: Communicative English for Undergraduate Students, 1<sup>st</sup> Edition, Orient Black Swan, 2023

#### **Reference Books:**

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

II SEMESTER	L	T	P	C
	3	-	-	3
23BS2T03: ENGINEERING CHEMISTRY				

**Course Objectives:**

- To familiarize engineering chemistry and its applications
- To impart the concept of soft and hard waters, softening methods of hard water
- To train the students on the principles and applications of electrochemistry, polymers, cement and modern engineering materials.

**Course Outcomes:**

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

**CO1:** Explain the impurities present in raw water, problems associated and how to avoid them. **(K2)**

**CO2:** Demonstrate the corrosion prevention methods and factors affecting corrosion. **(K2)**

**CO3:** Explain the preparation, properties, and applications of thermoplastics & thermosetting, elastomers, conducting polymers, calorific values, octane number, refining of petroleum and cracking of oils. **(K2)**

**CO4:** Explain the refractories, lubricants, and setting and hardening of cement. **(K2)**

**CO5:** Apply the principle of Band diagrams in the application of conductors and semiconductors. **(K3)**

**Syllabus:****UNIT I Water Technology**

Soft and hardwater, Estimation of hardness of water by EDTA Method, Estimation of dissolved Oxygen - Boiler troubles – Priming, foaming, scale and sludge, Caustic embrittlement, Industrial water treatment – Specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, Ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electrodialysis.

**UNIT II Electrochemistry and Applications**

**Electrodes** –electrochemical cell, Nernst equation, cell potential calculations.

Primary cells – Zinc-air battery, Secondary cells – lithium ion batteries- working principle of the batteries including cell reactions; Fuel cells-Basic Concepts, the principle and working of hydrogen-oxygen Fuel cell.

**Corrosion:** Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion, cathodic protection (Sacrificial anodic and impressed current), electroplating and electroless plating (Nickel).

**UNIT III Polymers and Fuel Chemistry**

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth polymerization.

Thermoplastics and Thermo-setting plastics-: Preparation, properties and applications of poly styrene. PVC, Nylon 6,6 and Bakelite.

Elastomers – Preparation, properties and applications of Buna S and Buna N.

Fuels – Types of fuels, calorific value of fuels, numerical problems based on calorific value; Analysis of coal (Proximate and Ultimate analysis), Liquid Fuels, refining of petroleum, Octane and Cetane number, alternative fuels: bio diesel.

#### **UNIT IV Building Materials & Lubricants**

Composites- Definition, Constituents, Classification- Fibre reinforced composites, properties and Engineering applications

Refractories- Classification, Properties, Factors affecting the refractory materials and Applications.

Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils – Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, saponification and Applications.

Building materials- Portland Cement, constituents, Setting and Hardening of cement.

#### **UNIT V Modern Engineering Materials**

Semiconductors – Introduction, basic concept, application. Semiconductor preparation by distillation method and purification by zone refining. Super conductors-Introduction basic concept, applications.

Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

#### **Textbooks:**

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

#### **Reference Books:**

1. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
2. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition



II SEMESTER	L	T	P	C
	3	-	-	3
<b>23BS2T04: DIFFERENTIAL EQUATIONS &amp; VECTOR CALCULUS</b>				

**Course Objectives:**

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

**Course Outcomes:**

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

**CO1:** Solve the differential equations related to various engineering fields. **(K3)**

**CO2:** Identify solution methods for partial differential equations that model physical processes. **(K2)**

**CO3:** Interpret the physical meaning of different operators such as gradient, curl and divergence. **(K3)**

**CO4:** Estimate the work done against a field, circulation and flux using vector calculus. **(K3)**

**Syllabus:****UNIT I: Differential equations of first order and first degree**

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

**UNIT II: Linear differential equations of higher order (Constant Coefficients)**

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems.

**UNIT III: Partial Differential Equations**

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

**UNIT IV: Vector differentiation**

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions Gradient, Directional derivative, del applied to vector point functions-Scalar Potential Function-Divergence-Solenoidal and Curl-Irrotational, vector identities.

**UNIT V: Vector integration**

Line integral-circulation-work done, Surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), Volume integral, Divergence theorem (without proof) and related problems.

**Textbooks:**

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44<sup>th</sup> Edition

**Reference book:**

2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10<sup>th</sup> Edition

II SEMESTER	L	T	P	C
	3	-	-	3
23ME2T01: BASIC CIVIL & MECHANICAL ENGINEERING				

### PART – A BASIC CIVIL ENGINEERING

#### Course Objectives:

1. Get familiarized with the scope and importance of Civil Engineering sub-divisions.
2. Introduce the preliminary concepts of surveying.
3. Acquire preliminary knowledge on Transportation and its importance in nation's economy.
4. Get familiarized with the importance of quality, conveyance and storage of water.
5. Introduction to basic civil engineering materials and construction techniques.

#### Course Outcomes:

On completion of the course, the student should be able to:

- CO1:** Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.(K2)
- CO2:** Know the concepts of surveying and to understand the measurement of distances, angles and levels Through surveying.(K2)
- CO3:** Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation.(K2)
- CO4:** Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.(K2)
- CO5:** Understand the basic characteristics of Civil Engineering Materials and attain knowledge on Prefabricated technology.(K2)

#### Syllabus:

##### UNIT I

**Basics of Civil Engineering:** Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering –Hydraulics and Water Resources Engineering – Environmental Engineering – Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.

##### UNIT II

**Surveying:** Objectives of Surveying – Horizontal Measurements – Angular Measurements-Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings- Contour mapping.

##### UNIT III

**Transportation Engineering:** Importance of Transportation in Nation's economic development- Types of Highway Pavements – Flexible Pavements and Rigid Pavements –Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.

**Water Resources and Environmental Engineering:** Introduction, Sources of water-Quality of water-Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

**Textbooks:**

1. Basic Civil Engineering, M.S.Palanisamy, Tata Mc Graw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S.Bhavikatti, New Age international Publishers, First Edition, 2022.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, First Edition, 2009.

**ReferenceBooks:**

1. Surveying, Vol-I and Vol-II, S.K.Duggal, Tata Mc Graw Hill Publishers, 2019, Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures –Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38<sup>th</sup> Edition.
4. Highway Engineering, S.K.Khanna, C.E.G.JustoandVeeraraghavan, Nemchand and Brothers Publications 2019. 10<sup>th</sup> Edition.
5. Indian Standard DRINKING WATER—SPECIFICATION : IS10500-2012.

**PART – B**  
**BASIC MECHANICAL ENGINEERING**

**Course Objectives:**

The students after completing the course are expected to

1. Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
2. Explain different engineering materials and different manufacturing processes.
3. Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.
- 4.

**Course Outcomes:**

On completion of the course, the student should be able to

**CO1:** Understand the different manufacturing processes.(K2)

**CO2:** Explain the basics of thermal engineering and its applications.(K2)

**CO3:** Describe the working of different mechanical power transmission systems and power Plants (K2)

**CO4:** Describe the basics of robotics and its applications.(K2)

**Syllabus:**

**UNIT I**

**Introduction to Mechanical Engineering:** Role of Mechanical Engineering in Industries and Society-Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

**Engineering Materials:** Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

**UNIT II**

**Manufacturing Processes:** Principles of Casting, Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

**Thermal Engineering:** Working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

### **UNIT III**

**Power plants:** Working principle of Steam, Diesel, Hydro, Nuclear power plants. Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

**Introduction to Robotics** - Joints & links, configurations, and applications of robotics.

#### **Textbooks:**

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
2. A text book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

#### **Reference Books:**

1. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.
2. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt.Ltd.
3. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
4. AppuuKuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I

II SEMESTER	L	T	P	C
	3	-	-	3
23ME2T03: ENGINEERING MECHANICS				

**Course Objectives:**

- To get familiarized with different types of force systems.
- To draw accurate free body diagrams representing forces and moments acting on a body to analyze the equilibrium of system of forces.
- To teach the basic principles of center of gravity, centroid and moment of inertia and determine them for different simple and composite bodies.
- To apply the Work-Energy method to particle motion.
- To understand the kinematics and kinetics of translational and rotational motion of rigid bodies.

**Course Outcomes:**

On Completion of the course, the student should be able to

**CO1:** Discuss the fundamental concepts in mechanics and determine the frictional forces for bodies in contact. **(K2)**

**CO2:** Analyze different force systems such as concurrent, coplanar and spatial systems and calculate their resultant forces and moments. **(K4)**

**CO3:** Calculate the centroid, centre of gravity and moment of inertia of different geometrical shapes. **(K3)**

**CO4:** Apply the principles of work-energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle. **(K3)**

**CO5:** Solve the problems involving the translational and rotational motion of rigid bodies. **(K3)**

**Syllabus:****UNIT I**

**Introduction to Engineering Mechanics:** Basic Concepts. Scope and Applications

**Systems of Forces:** Coplanar Concurrent Forces– Components in Space–Resultant–Moment of Force and its Application –Couples and Resultant of Force Systems.

**Friction:** Introduction, limiting friction and impending motion, Coulomb's laws of dry friction, coefficient of friction, Cone of Static friction.

**UNIT II**

**Equilibrium of Systems of Forces:** Free Body Diagrams, Lami's Theorem, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for Spatial System of forces, Numerical examples on spatial system of forces using vector approach, Analysis of plane trusses.

Principle of virtual work with simple examples

**UNIT III**

**Centroid:** Centroids of simple figures (from basic principles)–Centroids of Composite Figures. Centre of Gravity: Centre of gravity of simple body (from basic principles), Centre of gravity of composite bodies, Pappus theorems.

**Area Moments of Inertia:** Definition– Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.

**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**

**Rectilinear and Curvilinear motion of a particle:** Kinematics and Kinetics - D'Alembert's Principle - Work Energy method and applications to particle motion-Impulse Momentum method.

#### **UNIT V**

**Rigid body Motion:** Kinematics and Kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse Momentum method.

#### **Textbooks:**

1. Engineering Mechanics, S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., McGraw Hill Education 2017. 5th Edition.
2. Engineering Mechanics, P.C.Dumir- S.Sengupta and Srinivas V veeravalli , University press. 2020. First Edition.
3. A Textbook of Engineering Mechanics, S.S. Bhavikatti. New age international publications 2018. 4th Edition.

#### **Reference Books:**

1. Engineering Mechanics, Statics and Dynamics, Rogers and M A. Nelson., McGraw Hill Education. 2017. First Edition.

II SEMESTER	L	T	P	C
	-	-	2	1
23HS2L01: COMMUNICATIVE ENGLISH LAB				

**Course Objectives:**

The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills and also make them ready to face job interviews.

**Course Outcomes:**

**CO1:** Understand the different aspects of the English language proficiency with emphasis on LSRW skills.(K2)

**CO2:** Apply communication skills through various language learning activities.(K3)

**CO3:** Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.(K4)

**CO4:** Evaluate and exhibit professionalism in participating in debates and group discussions.(K5)

**CO5:** Create effective Course Objectives (K6)

**List of Topics:**

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interviews Skills

**Suggested Software:**

- Walden Infotech
- Young India Films

**Reference Books:**

- 1 Raman Meenakshi, Sangeeta-Sharma. Technical Communication. Oxford Press.2018.
- 2 Taylor Grant: English Conversation Practice, Tata McGraw-Hill Education India, 2016
- 3 Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012.
- 4 J. Sethi & P.V. Dhamija. A Course in Phonetics and Spoken English, (2nd Ed), Kindle, 2013

**Web Resources:**

Spoken English:

- 1 [www.esl-lab.com](http://www.esl-lab.com)
- 2 [www.englishmedialab.com](http://www.englishmedialab.com)
- 3 [www.englishinteractive.net](http://www.englishinteractive.net)
- 4 <https://www.britishcouncil.in/english/online>
- 5 <http://www.letstalkpodcast.com/>
- 6 [https://www.youtube.com/c/mmmEnglish\\_Emma/featured](https://www.youtube.com/c/mmmEnglish_Emma/featured)
- 7 <https://www.youtube.com/c/ArnelsEverydayEnglish/featured>



- 8 <https://www.youtube.com/c/engvidAdam/featured>
- 9 <https://www.youtube.com/c/EnglishClass101/featured>
- 10 <https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists>
- 11 [https://www.youtube.com/channel/UCV1h\\_cBE0Drdx19qkTM0WNw](https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw)

Voice & Accent:

1. <https://www.youtube.com/user/letstalkaccent/videos>
2. <https://www.youtube.com/c/EngLanguageClub/featured>
3. [https://www.youtube.com/channel/UC\\_OskgZBoS4dAnVUgJVexc](https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc)
4. [https://www.youtube.com/channel/UCNfm92h83W2i2jc5Xwp\\_IA](https://www.youtube.com/channel/UCNfm92h83W2i2jc5Xwp_IA)

II SEMESTER	L	T	P	C
	-	-	2	1
23BS2L03: ENGINEERING CHEMISTRY LAB				

**Course Objectives:**

To verify the fundamental concepts with experiments

**Course Outcomes:**

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

**CO1:** Determine the cell constant and conductance of solutions. **(K3)**

**CO2:** Prepare advanced polymer materials. **(K3)**

**CO3:** Determine the physical properties like surface tension, adsorption and viscosity. **(K3)**

**CO4:** Estimate the Iron and Calcium in cement. **(K3)**

**CO5:** Calculate the hardness of water. **(K3)**

**List of Experiments:**

1. Determination of Hardness of a groundwater sample.
2. Estimation of Dissolved Oxygen by Winkler's method
3. Determination of Strength of an acid in Pb-Acid battery
4. Preparation of a polymer (Bakelite)
5. Determination of percentage of Iron in Cement sample by colorimetry
6. Estimation of Calcium in port land Cement
7. Preparation of nano materials by precipitation method.
8. Adsorption of acetic acid by charcoal
9. Determination of percentage Moisture content in a coal sample
10. Determination of Viscosity of lubricating oil by Redwood Viscometer 1
11. Determination of Viscosity of lubricating oil by Redwood Viscometer 2
12. Determination of Calorific value of gases by Junker's gas Calorimeter

**Reference Book:**

- 1 "Vogel's Quantitative Chemical Analysis, 6th Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar.

II SEMESTER	L	T	P	C
	-	-	3	1.5
<b>23ME2L01: ENGINEERING WORKSHOP</b>				

**Course Objectives:**

To familiarize students with wood working, sheet metal operations, fitting, electrical house wiring skills, and basic repairs of two-wheeler vehicle.

**Course Outcomes:**

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

**CO1:** Identify workshop tools and their operational capabilities.(K2)

**CO2:** Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.(K3)

**CO3:** Apply fitting operations in various applications.(K3)

**CO4:** Apply basic electrical engineering knowledge for House Wiring Practice (K3)

**Syllabus:**

- Demonstration:** Safety practices and precautions to be observed in workshop.
- Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
  - Half – Lap joint
  - Mortise and Tenon joint
  - Corner Dovetail joint or Bridle joint
- Sheet Metal Working:** Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
  - Tapered tray
  - Conical funnel
  - Elbow pipe
  - Brazing
- Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
  - V-fit
  - Dovetail fit
  - Semi-circular fit
  - Bicycle tire puncture and change of two-wheeler tyre
- Electrical Wiring:** Familiarity with different types of basic electrical circuits and make the following connections.
  - Parallel and series
  - Two-way switch
  - Godown lighting
  - Tube light
  - Three phase motor
  - Soldering of wires
- Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
- Welding Shop:** Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
- Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.
- Basic repairs of Two-wheeler vehicle:** Demonstration of working of two-wheeler vehicle and its repairs.

**Textbooks:**

- Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published, 2019.
- Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
- A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

**Reference Books:**

- Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
- Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
- Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

II SEMESTER	L	T	P	C
	-	-	3	1.5
<b>23CE2L01: ENGINEERING MECHANICS &amp; BUILDING PRACTICES LAB</b>				

**Course Objectives:**

The students completing the course are expected to

- Verify the Law of Parallelogram of Forces and Lami's theorem.
- Determine the coefficients of friction of Static and Rolling friction and Centre of gravity of different plane Lamina.
- Understand the layout of a building, concepts of Non-Destructive Testing and different alternative Materials.

**Course Outcomes:**

On completion of the course, the student should be able to:

- CO1:** Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller. **(K3)**
- CO2:** Verify Law of Parallelogram of forces and Law of Moment using force polygon and bell crank lever. **(K3)**
- CO3:** Determine the Centre of gravity and Moment of Inertia of different configurations. **(K3)**
- CO4:** Understand the Quality Testing and Assessment Procedures and principles of Non-Destructive Testing. **(K2)**
- CO5:** Exposure to safety practices in the construction industry. **(K2)**

**Students have to perform any 10 of the following Experiments:**

1. To study various types of tools used in construction.
2. Forces in Pin Jointed Trusses
3. Experimental Proof of Lami's Theorem
4. Verification of Law of Parallelogram of Forces.
5. Determination of Center of Gravity of different shaped Plane Lamina.
6. Determination of coefficient of Static and Rolling Friction.
7. Verification of Law of Moment using Rotation Disc Apparatus and Bell Crank Lever
8. Study of Alternative Materials like M-sand, Fly ash, Sea Sand etc.
9. Field-Visit to understand the Quality Testing - report.
10. Safety Practices in Construction industry
11. Demonstration of Non-Destructive Testing - using Rebound Hammer & UPV
12. Study of Plumbing in buildings.

**Reference Books:**

- 1 S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., Engineering Mechanics, 5th Edition, McGraw Hill Education.
- 2 Hibbeler R.C., Engineering Mechanics: Statics and Dynamics, 14th Edition, Pearson Education, Inc., New Delhi, 2022

II SEMESTER	L	T	P	C
	-	-	1	0.5
<b>23BS2P01: HEALTH AND WELLNESS, YOGA AND SPORTS</b>				

**Course Objectives:**

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

**Course Outcomes:**

After completion of the course the student will be able to

**CO1:** Understand the importance of yoga and sports for Physical fitness and sound health.(K2)

**CO2:** Demonstrate an understanding of health-related fitness components.(K2)

**CO3:** Compare and contrast various activities that help enhance their health.(K2)

**CO4:** Assess current personal fitness levels.(K3)

**CO5:** Develop Positive Personality (K3)

**Syllabus:****UNIT I**

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

**Activities:**

- Organizing health awareness programmes in community
- Preparation of health profile
- Preparation of chart for balance diet for all age groups

**UNIT II**

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

**Activities:**

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

**UNIT III**

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

**Activities:**

- Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.  
Practicing general and specific warm up, aerobics
- Practicing cardio respiratory fitness, treadmill, run test, 9 min walk, skipping and running.

**Reference Books:**

- Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
- T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
- Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
- Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014.
- The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014.

**General Guidelines:**

- Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
- Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
- Institutes are required to provide sports instructor / yoga teacher to mentor the students.

**Evaluation Guidelines:**

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva-voce on the subject.

III SEMESTER	L	T	P	C
	3	-	-	3
<b>23BS3T05: NUMERICAL TECHNIQUES AND STATISTICAL METHODS</b>				

**Course Objectives:**

- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To familiarize the students with the foundations of probability and statistical methods.
- To equip the students to solve application problems in their disciplines.

**Course Outcomes:**

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

**CO1:** Evaluate the approximate roots of polynomial and transcendental equations by differential algorithms and apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals. **(K3)**

**CO2:** Apply numerical integral and differential methods to different Engineering problems. **(K3)**

**CO3:** Apply discrete and continuous probability distributions. **(K3)**

**CO4:** Apply Sampling Distribution and estimate the population parameters. **(K3)**

**CO5:** Examine the statistical inferential methods based on small and large sampling tests. **(K3)**

**Syllabus:****UNIT – I: Iterative Methods:**

Introduction – Solutions of algebraic and transcendental equations: Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method

**Interpolation:** Difference Operators-forward, backward, central & their properties-Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula.

**UNIT – II: Numerical integration, Solution of ordinary differential equations with initial conditions:**

Trapezoidal rule– Simpson's 1/3rd and 3/8th rule Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method –Modified Euler's method - Runge-Kutta method (second and fourth order) – Milne's Predictor and Corrector Method.

**UNIT – III: Probability and Distributions:**

Review of Probability and Baye's theorem – Random variables – Discrete and Continuous random variables –Distribution functions – Probability mass function, Probability density function and Cumulative distribution functions – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

**UNIT – IV: Sampling Theory:**

Introduction – Population and Samples – Sampling distribution of Means and Variance(definition only) – Point and Interval estimations – Maximum error of estimate – Central limit theorem (without proof) – Estimation using t,  $\chi^2$  and F-distributions.



### **UNIT – V: Tests of Hypothesis:**

Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors –Level of significance– One tail and two-tail tests – Test of significance for large samples and Small Samples: Single and difference means – Single and two proportions – Student's t- test, F-test,  $\chi^2$ -test.

#### **Textbooks:**

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications.

#### **Reference Books:**

1. Probability & Statistics, Dr T.K.V. Iyengar & Dr B.Krishna Gandhi, S.Chand Publishing.
2. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
3. Miller and Freund's, Probability and Statistics for Engineers, 7/e, Pearson.

III SEMESTER	L	T	P	C
	2	1	-	3
<b>23HS3T01: UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT</b>				

**Course Objectives:**

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

**Course Outcomes:**

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

**CO1:** Define the terms like Natural Acceptance, Happiness and Prosperity **(K1)**

**CO2:** Identify one's self, and one's surroundings (family, society nature) **(K2)**

**CO3:** Apply what they have learnt to their own self in different day-to-day settings in real life **(K3)**

**CO4:** Relate human values with human relationship and human society. **(K3)**

**CO5:** Justify the need for universal human values and harmonious existence **(K5)**

**CO6:** Develop as socially and ecologically responsible engineers **(K4)**

**Course Topics**

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1- hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

**UNIT I**

Introduction to Value Education

(6 lectures and 3 tutorials for practice session)

Lecture 1: Right Understanding, Relationship and Physical Facility  
(Holistic Development and the Role of Education)

Lecture 2: Understanding Value Education

Tutorial 1: Practice Session PS1 Sharing about Oneself

Lecture 3: self-exploration as the Process for Value Education

Lecture 4: Continuous Happiness and Prosperity – the Basic Human Aspirations

Tutorial 2: Practice Session PS2 Exploring Human Consciousness

Lecture 5: Happiness and Prosperity – Current Scenario

Lecture 6: Method to Fulfill the Basic Human Aspirations

Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

**UNIT II**

Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

Lecture 7: Understanding Human being as the Co-existence of the self and the body.

Lecture 8: Distinguishing between the Needs of the self and the body

Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.

Lecture 9: The body as an Instrument of the self

Lecture 10: Understanding Harmony in the self

Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self

Lecture 11: Harmony of the self with the body

Lecture 12: Programme to ensure self-regulation and Health

Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

**UNIT III** Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction

Lecture 14: 'Trust' – the Foundational Value in Relationship

Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust

Lecture 15: 'Respect' – as the Right Evaluation

Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect

Lecture 16: Other Feelings, Justice in Human-to-Human Relationship

Lecture 17: Understanding Harmony in the Society

Lecture 18: Vision for the Universal Human Order

Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

**UNIT IV** Harmony in the Nature/Existence

(4 lectures and 2 tutorials for practice session)

Lecture 19: Understanding Harmony in the Nature

Lecture 20: Interconnectedness, self-regulation and Mutual fulfilment among the Four Orders of Nature

Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature

Lecture 21: Realizing Existence as Co-existence at All Levels

Lecture 22: The Holistic Perception of Harmony in Existence

Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

**UNIT V** Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)

Lecture 23: Natural Acceptance of Human Values

Lecture 24: Definitiveness of (Ethical) Human Conduct

Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct

Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order

Lecture 26: Competence in Professional Ethics

Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education

Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies

Lecture 28: Strategies for Transition towards Value-based Life and Profession

Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education

PS1 Sharing about Oneself

PS2 Exploring Human Consciousness

PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being

PS4 Exploring the difference of Needs of self and body

PS5 Exploring Sources of Imagination in the self

PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society

PS7 Exploring the Feeling of Trust

PS8 Exploring the Feeling of Respect

PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)

PS10 Exploring the Four Orders of Nature

PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics

PS12 Exploring Ethical Human Conduct

PS13 Exploring Humanistic Models in Education

PS14 Exploring Steps of Transition towards Universal Human Order

**READINGS:**

**Textbook and Teachers Manual**

**a. The Textbook**

R R Gaur, R Asthana, G P Bagaria, *A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

**b. The Teacher's Manual**

R R Gaur, R Asthana, G P Bagaria, *Teachers' Manual for A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

**Reference Books**

1. *Jeevan Vidya: Ek Parichaya*, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. *Human Values*, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. *The Story of Stuff* (Book).
4. *The Story of My Experiments with Truth* - by Mohandas Karamchand Gandhi
5. *Small is Beautiful* - E. F Schumacher.
6. *Slow is Beautiful* - Cecile Andrews
7. *Economy of Permanence* - J C Kumarappa
8. *Bharat Mein Angreji Raj* – Pandit Sunderlal
9. *Rediscovering India* - by Dharampal
10. *Hind Swaraj or Indian Home Rule* - by Mohandas K. Gandhi
11. *India Wins Freedom* - Maulana Abdul Kalam Azad
12. *Vivekananda* - Romain Rolland (English)
13. *Gandhi* - Romain Rolland (English)

### Mode of Conduct:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration. Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than "extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.

Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

### Online Resources:

1. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf>
2. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf>
3. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf>
4. <https://fdp-si.aicte-india.org/UHV%20I%20Teaching%20Material/D3-S2%20Respect%20July%202023.pdf>
5. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf>
6. <https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%20D3-S2A%20Und%20Nature-Existence.pdf>
7. <https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf>
8. <https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385>
9. [https://onlinecourses.swayam2.ac.in/aic22\\_ge23/preview](https://onlinecourses.swayam2.ac.in/aic22_ge23/preview)

III SEMESTER	L	T	P	C
	3	-	-	3
23CE3T01: SURVEYING				

**Course Objectives:**

- To Know the principle and methods of surveying and measuring of horizontal and vertical distances and angles
- To Identification of source of errors and rectification methods
- To Know surveying principles to determine areas and volumes
- To Setting out curves and use modern surveying equipments for accurate results
- To Know the basics of Photogrammetry Surveying.

**Course Outcomes:**

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

**CO1:** Discuss the principle and methods of surveying and measuring of horizontal and vertical distances and angles, levels and contours. **(K2)**

**CO2:** Identify the source of errors and rectification methods. **(K2)**

**CO3:** Apply surveying principles to determine areas and volumes. **(K3)**

**CO4:** Describe types of curves and usage of modern surveying equipments. **(K2)**

**CO5:** Explain the basics of Photogrammetry Surveying in field. **(K2)**

**Syllabus:****UNIT - I**

**Introduction and Basic Concepts:** Introduction, Objectives, classification and principles of surveying, Surveying accessories. Introduction to Compass, leveling and Plane table surveying.

**Linear distances-** Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections.

**Prismatic Compass-** Bearings, included angles, Local Attraction, Magnetic Declination, and dip – systems and W.C.B and Q.B systems of locating bearings.

**UNIT - II**

**Leveling-** Types of levels, methods of levelling, and Determination of levels, Effect of Curvature of Earth and Refraction.

**Contouring-** Characteristics and uses of Contours, methods of contour surveying.

**Areas -** Determination of areas consisting of irregular boundary and regular boundary. **Volumes -** Determination of volume of earth work in cutting and embankments for level section, capacity of reservoirs.

**UNIT - III**

**Theodolite Surveying:** Types of Theodolites, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical leveling when base is accessible and inaccessible.

**Traversing:** Methods of traversing, traverse computations and adjustments, Introduction to Omitted measurements.

#### UNIT - IV

**Curves:** Types of curves and their necessity, elements of simple, compound, reverse curves. Introduction to Tacheometric Surveying.

**Modern Surveying Methods:** Principle and types of E.D.M. Instruments, Total station- advantages and Applications. Introduction to Global Positioning System. Introduction to Drone survey and LiDAR Survey (Light Detection And Ranging).

#### UNIT - V

##### **Photogrammetry Surveying:**

Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereo-plotting instruments, mosaics, map substitutes.

##### **Text Books:**

1. Surveying (Vol – 1 & 2) by Duggal S K, Tata McGraw Hill Publishing Co.Ltd. New Delhi, 5<sup>th</sup> edition, 2019.
2. Textbook of Surveying by C Venkatramaiah, Universities Press 1<sup>st</sup> Edition, 2011.

##### **Reference Books:**

1. Surveying (Vol – 1), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain -Laxmi Publications (P) Ltd., New Delhi, 18<sup>th</sup> edition 2024.
2. Surveying (Vol – 2), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain -Laxmi Publications (P) Ltd., New Delhi 17<sup>th</sup> 2022.
3. Surveying (Vol – 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain -Laxmi Publications (P) Ltd., New Delhi 16<sup>th</sup> 2023.
4. Plane Surveying and Higher Surveying by Chandra A M, New age International pvt. Ltd., Publishers, New Delhi, 3<sup>rd</sup> Edition, 2015.
5. Surveying and Levelling by N.Basak Tata McGraw Hill Publishing Co. Ltd. New Delhi, 4<sup>th</sup> edition, 2014.
6. Surveying (Vol 1, 2 & 3), by Arora K R, Standard Book House, Delhi. Edition: 12th, 2015.

##### **Web Resources:**

- 1 [https://koha.srmap.edu.in/cgi-bin/koha/opac-detail.pl?biblionumber=11522&shelfbrowse\\_itemnumber=23066](https://koha.srmap.edu.in/cgi-bin/koha/opac-detail.pl?biblionumber=11522&shelfbrowse_itemnumber=23066)



III SEMESTER	L	T	P	C
	3	-	-	3
<b>23CE3T02: STRENGTH OF MATERIALS</b>				

**Course Learning Objectives:**

- To impart Fundamental concepts of Strength of Material and Principles of Elasticity and Plasticity Stress
- To impart concepts of shear force and bending moment on various types of beams and loading conditions
- To impart concepts of stresses developed in the cross section and bending equations calculation of section modulus of sections with different cross sections.
- To the concepts above will be utilized in measuring deflections in beams under various loading and support conditions.
- To classify cylinders and columns based on their thickness and to derive equations for measurement of stresses across the cross section when subjected to external pressure.

**Course Outcomes:**

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

**CO 1:** Explain the basic materials behavior under the influence of different external loading conditions and the support conditions. **(K2)**

**CO 2:** Draw the diagrams indicating the variation of the key performance features like axial forces, bending moment and shear forces in structural members. **(K3)**

**CO 3:** Acquire knowledge of bending concepts and calculation of section modulus and for determination of stresses developed in the beams. **(K3)**

**CO 4:** Calculate deflections in the beams due to various loading and support conditions. **(K3)**

**CO 5:** Compute stresses across section of the thin, thick cylinders and columns to arrive at optimum sections to withstand the internal pressure using Lamé's Equation. **(K3)**

**Syllabus:****UNIT — I:**

**Simple Stresses and Strains:** Elasticity and plasticity — Types of stresses and strains — Hooke's law — Factor of safety, Poisson's ratio - Relationship between Elastic constants — Bars of varying section — stresses in composite bars.

**UNIT — II:**

**Shear Force and Bending Moment:** Definition of beam — Types of beams — Concept of shear force and bending moment — Point of contra flexure — Relation between S.F., B.M, and rate of loading at a section of a beam; S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads.

**UNIT — III:****Flexural and Shear Stresses:**

**Flexural Stresses:** Theory of simple bending — Assumptions — Derivation of bending equation, Neutral axis — Determination of bending stresses — section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections — Design of simple beams.



**Shear Stresses:** Derivation of formula — Shear stress distribution across various beam sections like rectangular, circular, I, T Angle sections. **Torsion** – circular shafts only.

**UNIT — IV:**

**Deflection of Beams:** Double integration and Macaulay's methods — Determination of slope and deflection for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads. Mohr's theorems — Moment area method — application to simple cases of cantilever.

**UNIT — V:**

Introduction – Classification of columns – Axially loaded compression members – Euler's crippling load theory – Derivation of Euler's critical load formulae for various end conditions – Equivalent length – Slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Eccentric loading and Secant formula – Prof. Perry's formula.

**Thin and Thick cylindrical shells** — Derivation of formula for longitudinal and circumferential stresses — hoop, longitudinal and volumetric strains — changes in diameter, and volume of thin cylinders. Lames theory for thick cylinders, Derivation of Lames formulae, distribution of hoop and radial stresses across the thickness, compound cylinders- distribution of stresses.

**Text Books:**

1. Strength of Materials by R. K. Bansal, Lakshmi Publications, 16<sup>th</sup> Edition, 2022.
2. Strength of Materials by B. S. Basavarajaiah and P. Mahadevappa, Universities Press 3<sup>rd</sup> Edition, 2010.
3. Strength of Materials by J.K. Gupta and S.K. Gupta, Cengage publications 2<sup>nd</sup> edition, 2024.

**Reference Books:**

1. Advanced Mechanics of Solids, L.S Srinath, McGraw Hill Education, 2017, 3rd Edition
2. Strength of Materials - Fundamentals and Applications, T.D.Gunneswara Rao and Mudimby Andal, Cambridge University Press, 2018, 1st Edition
3. Mechanics of Materials, Beer and Johnston, McGraw Hill India Pvt. Ltd., 2020, 8th Edition (SI Units).
4. Mechanics of Solids — E P Popov, Prentice Hall, 2<sup>nd</sup> Edition, 2015.
5. A Textbook of Strength of Materials, by R. K. Rajput, 7e (Mechanics of Solids) SI Units S. Chand & Co, New Delhi 7<sup>th</sup> edition 2022.
6. Strength of Materials by S.S.Ratan Tata McGrill Publications 3<sup>rd</sup> Edition, 2016.

**Web-Resources:**

- 1 <https://nptel.ac.in/courses/112107146>
- 2 <https://nptel.ac.in/courses/105105108>

III SEMESTER	L	T	P	C
	3	-	-	3
23CE3T03: FLUID MECHANICS				

**Course Objectives:**

- To explain basics of statics, kinematics and dynamics of fluids and various measuring techniques of hydrostatic forces on objects.
- To impart ability to solve engineering problems in fluid mechanics
- To enable the students measure quantities of fluid flowing in pipes, tanks and channels
- To teach integral forms of fundamental laws of fluid mechanics to predict relevant pressures, velocities and forces.
- To strengthen the students with fundamentals useful in application-intensive courses dealing with hydraulics, hydraulic machinery and hydrology in future courses.

**Course Outcomes:**

On Completion of the course, the students will be able to

**CO1:** Describe the principles of fluid statics, kinematics and dynamics (K2)

**CO2:** Apply the laws of fluid statics and concepts of buoyancy (K3)

**CO3:** Explain the fundamentals of fluid kinematics and differentiate types of fluid flows (K2)

**CO4:** Express the Principle of conservation of energy for flow measurement. (K3)

**CO5:** Determine the losses in pipes and discharge through pipe network. (K3)

**Syllabus:****UNIT - I**

**Basic concepts and definitions:** Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; Variation of viscosity with temperature, Newton law of viscosity; Vapor pressure, Boiling point, Surface tension, Capillarity, Bulk modulus of elasticity, Compressibility

**UNIT – II**

**Fluid statics:** Fluid Pressure: Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U Tube Differential Manometer. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

**UNIT - III**

**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; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One, two and three - Dimensional continuity equations in Cartesian coordinates.

#### UNIT - IV

**Fluid Dynamics:** Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – Derivation; Energy Principle; Practical applications of Bernoulli's equation : Venturimeter, orifice meter and Pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number;

#### UNIT - V

**Analysis Of Pipe Flow:** Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length – Pipes in Parallel and Series.

#### Text Books:

1. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House, 2019.
2. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2<sup>nd</sup> edition 2018

#### Reference Books:

1. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi 11<sup>th</sup> edition, 2024.
2. N. Narayana Pillai, Principles of Fluid Mechanics and Fluid Machines, Universities Press Pvt Ltd, Hyderabad. 3rd Edition 2009.
3. Fluid Mechanics by Frank M. White, Henry Xue, Tata McGraw Hill, 9<sup>th</sup> edition, 2022.
4. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010.
5. Introduction to Fluid Mechanics & Fluid Machines by S K Som, Gautam Biswas, S Chakraborty Tata McGraw Hill, 3<sup>rd</sup> edition 2011

#### Web Resources:

1. <https://archive.nptel.ac.in/courses/112/105/112105269/>
2. <https://nptel.ac.in/courses/112104118>
3. <https://nptel.ac.in/courses/105103192>

III SEMESTER	L	T	P	C
	-	-	3	1.5
<b>23CE3L01: SURVEYING LAB</b>				

**Course Objectives:**

- To Know about various linear and angular measuring instruments
- To Take Measurements in the linear and angular view
- To Determine the area and volume by interpreting the data obtained from surveying activities
- To Know modern equipment such as total station
- To Draft field notes from survey data

**Course Outcomes:**

Upon the successful completion of this course, the students will able to:

**CO1:** Handle various linear and angular measuring instruments (**K2**)

**CO2:** Measure the linear and angular measurements (**K3**)

**CO3:** Calculate the area and volume by interpreting the data obtained from surveying activities (**K3**)

**CO4:** Handle modern equipment such as total station (**K2**)

**CO5:** Prepare field notes from survey data (**K3**)

**List of Field Works:**

1. Chain survey of road profile with offsets in case of road widening.
2. Determination of distance between two inaccessible points by using compass.
3. Plane table survey ;finding the area of a given boundary by the method of Radiation
4. Fly levelling : Height of the instrument method (differential leveling)
5. Fly levelling: rise and fall method.
6. Theodolite survey: determining the horizontal and vertical angles by the method of repetition method
7. Theodolite survey: finding the distance between two in accessible points.
8. Theodolite survey: finding the height of far object.
9. Determination of area perimeter using total station.
10. Determination of distance between two inaccessible point by using total station.
11. Setting out a curve
12. Determining the levels of contours

**Web Resources:**

1. <http://sl-iitr.vlabs.ac.in/List%20of%20experiments.html>

III SEMESTER	L	T	P	C
	-	-	3	1.5
23CE3L02 : STRENGTH OF MATERIALS LAB				

**Course objectives:**

- To determine the tensile strength and yield parameters of mild steel
- To find out flexural strengths of Steel/Wood specimens and measure deflections
- To determine the torsion parameters of mild steel bar
- To determine the hardness numbers, impact and shear strengths of metals
- To determine the load-deflection parameters for springs

**Course Outcomes:**

Upon the successful completion of this course, the students will able to:

**CO1:** Conduct tensile strength test and draw stress-strain diagrams for ductile metals (**K3**)

**CO2:** Perform bending test and determine load-deflection curve of steel/wood (**K3**)

**CO3:** Conduct torsion test and determine torsion parameters (**K3**)

**CO4:** Perform hardness, impact and shear strength tests and calculate hardness numbers, impact and shear strengths (**K3**)

**CO5:** Conduct tests on closely coiled and open coiled springs and calculate deflections (**K3**)

**List of Experiments:**

1. Tension test.
2. Bending test on (Steel/Wood) Cantilever beam.
3. Bending test on simply supported beam.
4. Torsion test.
6. Hardness test.
7. Compression test on Open coiled springs
8. Tension test on Closely coiled springs
9. Compression test on wood/ concrete
10. Izod / Charpy Impact test on metals
11. Shear test on metals
12. Use of electrical resistance strain gauges.
13. Continuous beam – deflection test.

**Web Resources:**

1. <https://sm-nitk.vlabs.ac.in/List%20of%20experiments.html>

III SEMESTER	L	T	P	C
	-	1	2	2
<b>23CE3S01: BUILDING PLANNING AND DRAWING</b>				

**Course Objectives:**

- To Initiate the student to different building bye-laws and regulations.
- To Impart the planning aspects of residential buildings and public buildings.
- To Give training exercises on various signs and bonds.
- To Give training exercises on different building units.
- To Impart the skills and methods of planning of various buildings.

**Course Outcomes:**

Upon successful completion of this course the students will be able to:

**CO1:** Plan various buildings as per the building by-laws. **(K3)**

**CO2:** Distinguish the relation between the plan, elevation and cross section and identify the form and functions among the buildings. **(K2)**

**CO3:** Draw signs and bonds **(K3)**

**CO4:** Draw different building units **(K3)**

**CO5:** Learn the skills of drawing building elements and plan the buildings as per requirements. **(K3)**

**Syllabus:**

- 1 Detailing & Drawing of Sign Conventions.
- 2 Detailing & Drawing of English Bond.
- 3 Detailing & Drawing of Flemish Bond.
- 4 Detailing & Drawing of Doors.
- 5 Detailing & Drawing of Windows.
- 6 Detailing & Drawing of Ventilators & Roofs.
- 7 Drawing of Line Diagram of Residential Buildings by using Building Bye- Laws.
- 8 Drawing of Plan, Elevation & Section from line diagram for a single Storey Building.
- 9 Drawing of Plan, Elevation & Section for Hospital Building.
- 10 Drawing of Plan, Elevation & Section for Industrial Building.

**Text Books:**

1. Planning, designing and Scheduling, Gurcharan Singh and Jagdish Singh
2. Building planning and drawing by M. Chakraborti.
3. Building drawing, M G Shah, C M Kale and S Y Patki, Tata McGraw Hill, NewDelhi.

**Reference Books:**

1. National Building Code 2016 (Volume- I & II).
2. Principles of Building Drawing, M G Shah and C M Kale, Trinity Publications, New Delhi.
3. Civil Engineering drawing and House planning, B. P. Verma, Khanna publishers, New Delhi.
4. Civil Engineering Building practice, Suraj Singh: CBS Publications, New Delhi, and Chennai
5. Building Materials and Construction, G. C Saha and Joy Gopal Jana, McGrawHill Education (P) India Ltd. New Delhi.

III SEMESTER	L	T	P	C
	2	-	-	-
<b>23BS3M01: ENVIRONMENTAL SCIENCE</b>				

**Course Objectives:**

- To make the students to get awareness on environment
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life
- To save earth from the inventions by the engineers.

**Course Outcomes:**

Upon successful completion of this course the students will be able to:

- CO1:** Grasp multi disciplinary nature of environmental studies and various renewable and non-renewable resources. **(K2)**
- CO2:** Describe flow and bio-geo- chemical cycles and ecological pyramids. **(K2)**
- CO3:** Express various causes of pollution and solid waste management and related preventive measures. **(K2)**
- CO4:** Explain the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation. **(K2)**
- CO5:** Discuss causes of population explosion, value education and welfare programmes. **(K2)**

**Syllabus:****UNIT – I**

**Multidisciplinary Nature of Environmental Studies:** – Definition, Scope and Importance – Need for Public Awareness.

**Natural Resources :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people –Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – **Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

**UNIT – II**

**Ecosystems:** Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**Biodiversity and Its Conservation :** Introduction and Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

### UNIT – III

Environmental Pollution: Definition, Cause, effects and control measures of:

- a. Air Pollution.
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

### UNIT – IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

### UNIT – V

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

#### Textbooks:

1. Erach Bharucha, Text book of Environmental Studies for Undergraduate Courses, Universities Press (India) Private Limited, 2019.
2. Palaniswamy, Environmental Studies, 2/e, Pearson education, 2014.
3. S.Azeem Unnisa, Environmental Studies, Academic Publishing Company, 2021.
4. K.Raghavan Nambiar, “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, SciTech Publications (India), Pvt. Ltd, 2010

#### Reference Books:

1. Deeksha Dave and E.Sai Baba Reddy, Textbook of Environmental Science, 2/e, Cengage Publications, 2012.
2. M.Anji Reddy, “Textbook of Environmental Sciences and Technology”, BSPublication, 2014.
3. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, 2006.
4. J. Glynn Henry and Gary W. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.
5. G.R. Chatwal, A Text Book of Environmental Studies, Himalaya Publishing House, 2018.
6. Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineering and Science, 1/e, Prentice Hall of India Private limited, 1991.



**Web Resources:**

- [https://onlinecourses.nptel.ac.in/noc23\\_hs155/preview](https://onlinecourses.nptel.ac.in/noc23_hs155/preview)
- [https://www.edx.org/learn/environmental-science/rice-university-ap-r-environmental-science-part-3-pollution-and-resources?index=product&objectID=course-3a6da9f2-d84c-4773-8388-1b2f8f6a75f2&webview=false&campaign=AP%C2%AE+Environmental+Science++Part+3%3A+Pollution+and+Resources&source=edX&product\\_category=course&placement\\_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fenvironmental-science](https://www.edx.org/learn/environmental-science/rice-university-ap-r-environmental-science-part-3-pollution-and-resources?index=product&objectID=course-3a6da9f2-d84c-4773-8388-1b2f8f6a75f2&webview=false&campaign=AP%C2%AE+Environmental+Science++Part+3%3A+Pollution+and+Resources&source=edX&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fenvironmental-science)
- <http://ecoursesonline.iasri.res.in/Courses/Environmental%20Science-I/Data%20Files/pdf/lec07.pdf>
- <https://www.youtube.com/watch?v=5QxxaVfgQ3k>

IV SEMESTER	L	T	P	C
	2	-	-	2
<b>23BM4T01: MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS</b>				

**Course Objectives:**

- To inculcate the basic knowledge of microeconomics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

**Course Outcomes:**

Upon successful completion of this course the students will be able to:

**CO1:** Define the concepts related to Managerial Economics, financial accounting and management **(K2)**

**CO2:** Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets **(K2)**

**CO3:** Apply the Concept of Production cost and revenues for effective Business decision **(K3)**

**CO4:** Analyze how to invest their capital and maximize returns **(K4)**

**CO5:** Evaluate the capital budgeting techniques. **(K5)**

**CO6:** Develop the accounting statements and evaluate the financial performance of business entity **(K5)**

**Syllabus:****UNIT - I Managerial Economics**

Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

**UNIT - II Production and Cost Analysis**

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

**UNIT - III Business Organizations and Markets**

Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition– Oligopoly-Price-Output Determination - Pricing Methods and Strategies

**UNIT - IV Capital Budgeting**

Introduction – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

## **UNIT - V      Financial Accounting and Analysis**

Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

### **Textbooks:**

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

### **Reference Books:**

1. Ahuja HI Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

### **Web Resources:**

1. <https://www.slideshare.net/123ps/managerial-economics ppt>
2. <https://www.slideshare.net/rossanz/production-and-cost 45827016>
3. <https://www.slideshare.net/darkyla/business-organizations-19917607>
4. <https://www.slideshare.net/balarajbl/market-and-classification-of-market>
5. <https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396>
6. <https://www.slideshare.net/ashu1983/financial-accounting>

IV SEMESTER	L	T	P	C
	3	-	-	3
<b>23CE4T01: ENGINEERING GEOLOGY</b>				

**Course Objectives:**

- To know the importance of Engineering Geology to the Civil Engineering.
- To enable the students understand what minerals and rocks are and their formation and identification.
- To highlight significance/ importance/ role of Engineering Geology in construction of Civil Engineering structures.
- To enable the student realize its importance and applications of Engineering Geology in Civil Engineering constructions.
- To know the concepts of Groundwater and its geophysical methods.

**Course Outcomes:**

Upon the successful completion of this course, the students will be able to:

**CO1:** Understand the significance of geological agents on Earth surface and its significance in Civil Engineering. **(K2)**

**CO2:** Identify and understand the properties of Minerals and Rocks. **(K2)**

**CO3:** Explain the concepts of Groundwater and its geophysical methods. **(K2)**

**CO4:** Classify and measure the Earthquake prone areas, Landslides and subsidence to practice the hazard zonation. **(K2)**

**CO5:** Investigate the project site for mega/mini civil engineering projects and site selection for mega engineering projects like Dams, Reservoirs and Tunnels. **(K3)**

**SYLLABUS:****UNIT-I:**

**Introduction:** Branches of Geology, Importance of Geology in Civil Engineering with case studies, Weathering of rocks, Geological agents, weathering process of Rock, Rivers and geological work of rivers.

**UNIT-II**

**Mineralogy And Petrology:** Definitions of mineral and rock-Different methods of study of mineral and rock. Physical properties of minerals and rocks for megascopic study for the following minerals and rocks. Common rock forming minerals: Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite and Bauxite. Classification, structures, textures and forms of Igneous rocks, Sedimentary rocks, Metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate.

### UNIT-III

**Structural Geology:** Strike , Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering.

### UNIT-IV

**Ground Water:** Water table, Cone of depression, Geological controls of Ground Water Movement, Ground Water Exploration Techniques.

**Earthquakes and Land Slides:** Terminology, Classification, causes and effects, Shield areas and Seismic belts, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Landslides.

**Geophysics:** Importance of Geophysical methods, Classification, Principles of Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.

### UNIT-V

**Geology of Dams, Reservoirs and Tunnels:** Types and purpose of Dams, Geological considerations in the selection of a Dam site. Geology consideration for successful constructions of reservoirs, Life of Reservoirs. Purpose of Tunnelling, effects, Lining of Tunnels. Influence of Geology for successful Tunnelling.

#### Text Books:

1. Engineering Geology by N. ChennaKesavulu, Laxmi Publications . 2<sup>nd</sup>Edn 2014.
2. Engineering & General Geology by Parbin Singh Katson educational series 8<sup>th</sup> 2023

#### Reference Books:

1. Engineering Geology by SubinoyGangopadhyay Oxford University press 1<sup>st</sup> edition, 2012.
2. Engineering Geology by D. Venkat Reddy, Vikas Publishing, 2<sup>nd</sup>Edn , 2017,
3. Geology for Engineers and Environmental Society' Alan E Kehew, 3rd edn., 2013) Pearson publications.
4. 'Environmental Geology' (2013) K.S.Valdiya, 2nd ed., McGraw Hill Publications.

#### Web Resources:

1. <http://nptel.iitm.ac.in/video.php?subjectId=105105106>
2. <http://nptel.iitm.ac.in/video.php?courseId=1055&p=1>
3. <http://nptel.iitm.ac.in/video.php?courseId=1055&p=3>
4. <http://nptel.iitm.ac.in/video.php?courseId=1055&p=4>

IV SEMESTER	L	T	P	C
	3	-	-	3
<b>23CE4T02: CONCRETE TECHNOLOGY</b>				

**Course Objectives:**

Upon successful completion of this course, the student will be able to

- Learn materials and their properties used in the production of concrete
- Learn the behavior of concrete at fresh stage
- Learn the behavior of concrete at hardened stage
- Learn the influence of elasticity, creep and shrinkage on concrete
- Learn the mix design methodology and special concretes

**Course Outcomes:**

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

**CO1:** Identify the characteristics of basic ingredients and properties of concrete. **(K2)**

**CO2:** Distinguish the properties of fresh and hardened concrete. **(K2)**

**CO3:** Estimate the quality of Hardened Concrete. **(K2)**

**CO4:** Describe the influence of elasticity, creep and shrinkage on concrete. **(K2)**

**CO5:** know the mix design methodology and significance of special concretes. **(K2)**

**Syllabus:****UNIT- I**

**Cements:** Portland cement – Chemical composition – Hydration, Setting of cement, Fineness of cement, Structure of hydrate cement – Test for physical properties – Different grades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silica fume

**Aggregates:** Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregates – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substances – Soundness – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates-Maximum aggregate size- Quality of mixing water.

**UNIT- II**

**Fresh Concrete:** Steps in Manufacture of Concrete–proportion, mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of 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 and vibration of concrete, Ready mixed concrete, Shotcrete.

**UNIT- III**

**Hardened Concrete:** Water / Cement ratio – Abram's Law – Gel/space ratio

Nature of strength of concrete –Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing, Testing of Hardened Concrete: Compression test – Tension test – Factors affecting strength – Flexure test –Splitting 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**

**Mix Design And Special Concretes:** Ready mixed concrete, Fibre reinforced concrete – Different types of fibres – Factors affecting properties of FRC, High performance concrete – Self consolidating concrete, Self healing concrete.

Factors in the choice of mix proportions –Quality control of concrete- Statistical methods- Acceptance Criteria-Concepts Proportioning of concrete mixes by ACI method and IS Code method

#### **Text Books:**

1. Properties of Concrete by A.M. Neville – PEARSON – 4th edition
2. Concrete Technology by M.L. Gambhir. – Tata Mc.Graw Hill Publishers, New Delhi 5<sup>th</sup> edition 2013.
3. Concrete Technology by Job Thomas, Cengage Publications, 1<sup>st</sup> edition, 2015

#### **Reference Books:**

1. Concrete Microstructure, Properties of Materials by P.K. Mehta and Moterio. McGraw Hill 4<sup>th</sup> edition 2014
2. Concrete Technology, J.J. Brooks and A. M. Neville, Pearson, 2019, 2nd Edition.
3. Concrete Technology by M. S. Shetty. – S. Chand & Co.; 2004
4. Concrete Technology by A.R. Santha Kumar, Oxford University Press, New Delhi

#### **Web resources:**

1. <https://archive.nptel.ac.in/courses/105/102/105102012/>
2. <https://archive.nptel.ac.in/courses/105/106/105106176/>

IV SEMESTER	L	T	P	C
	3	-	-	3
<b>23CE4T03: STRUCTURAL ANALYSIS</b>				

**Course Objectives**

Upon successful completion of this course, the student will be able to

- Learn energy theorems
- Learn the analysis of indeterminate structures
- Analysis of fixed and continuous beams
- Learn about slope-deflection method
- Learn about Moment – distribution method

**Course Outcomes:**

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

**CO1:** Apply energy theorems to analyze simple beams and trusses (**K3**)

**CO2:** Solve indeterminate structures by using Castigliano's-II theorem (**K3**)

**CO3:** Know the analysis of fixed and continuous beams (**K3**)

**CO4:** Use slope-deflection method for analyzing continuous beams and portal frames (**K3**)

**CO5:** Analyze continuous beams and portal frames by using Moment – distribution method (**K4**)

**UNIT – I**

**Energy Theorems:** Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces – Castigliano's first theorem- Deflections of simple beams and pin jointed trusses.

**UNIT - II**

**Analysis of Indeterminate Structures:** Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Solution of trusses with upto two degrees of internal and external indeterminacies – Castigliano's-II theorem.

**UNIT - III**

**Fixed Beams & Continuous Beams :** Introduction to statically indeterminate beams with uniformly distributed load, central point load, eccentric point load, number of pointloads, uniformly varying load, couple and combination of loads – Shear force and Bending moment diagrams – Deflection of fixed beams effect of sinking of support, effect of rotation of a support.

**UNIT - IV**

**Slope-Deflection Method:** Introduction-derivation of slope deflection equations- application to continuous beams with and without settlement of supports - Analysis of single bay portal frames without sway.

**UNIT - V**

**Moment Distribution Method:** Introduction to moment distribution method- Application to continuous beams with and without settlement of supports-Analysis of single bay storey portal frames without sway.



**Textbooks:**

1. Analysis of Structures – Vol-I&II by V.N.Vazirani&M.M.Ratwani, Khanna Publications, New Delhi.
2. Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers. 3<sup>rd</sup> edition 2017.

**Reference Books:**

1. Structural analysis by Aslam Kassimali Cengage publications 6<sup>th</sup> edition 2020.
2. Structural analysis Vol.I and II by Dr.R.Vaidyanathan and Dr.PPerumal– Laxmi publications. 3<sup>rd</sup> 2016
3. Introduction to structural analysis by B.D.Nautiyal, New Age international publishers, New Delhi.
4. Structural Analysis – D.S.Prakasarao -Univeristy press.
5. Strength of Materials and Mechanics of Structures by B.C.Punmia, Khanna Publications, New Delhi.

**Web Resources:**

1. <https://nptel.ac.in/courses/105105166>
2. <https://nptel.ac.in/courses/105101086>

IV SEMESTER	L	T	P	C
	3	-	-	3
<b>23CE4T04: HYDRAULICS AND HYRAULIC MACHINERY</b>				

**Course Objectives:**

- To Introduce concepts of laminar and turbulent flows
- To teach principles of uniform flows through open channel.
- To teach principles of non-uniform flows through open channel.
- To impart knowledge on design of turbines.
- To impart knowledge on design of pumps

**Course Outcomes:**

On Completion of the course, the students will be able to:

**CO1:** Understand the characteristics of laminar and turbulent flows. **(K2)**

**CO2:** Apply the knowledge of fluid mechanics to address the uniform flow problems in open channels. **(K3)**

**CO3:** Solve non-uniform flow problems and hydraulic jump phenomenon in open channel flows. **(K3)**

**CO4:** Know the performance of impact of jets on plates and design Pelton wheel, Francis and Kaplan turbine. **(K2)**

**CO5:** Understand the principles, losses and its efficiencies of centrifugal pumps **(K2)**

**Syllabus:****UNIT – I**

**Laminar & Turbulent flow in pipes:** Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity. Reynolds experiment, Transition from laminar to turbulent flow. Resistance to flow of fluid in smooth and rough pipes-Moody's diagram – Introduction to boundary layer theory.

**UNIT - II**

**Uniform flow in Open Channels:** Open Channel Flow - Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section. Hydraulically efficient channel sections: Rectangular, trapezoidal and triangular channels, Energy and Momentum correction factors.

**UNIT - III**

**Non-Uniform flow in Open Channels:** Specific energy, critical flow, discharge curve, Specific force, Specific depth, and Critical depth. Measurement of Discharge and Velocity – Gradually Varied Flow- Dynamic Equation of Gradually Varied Flow. Hydraulic Jump and classification - Elements and characteristics- Energy dissipation.

**Impact of Jets:** Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes - Velocity triangles at inlet and outlet - Work done and efficiency Hydraulic Turbines: Classification of turbines; pelton wheel and its design. Francis turbine and its design - efficiency - Draft tube: theory - characteristic curves of hydraulic turbines. Cavitation: causes and effects.

## UNIT – V

**pumps:** Working principles of a centrifugal pump, work done by impeller; heads, losses and efficiencies; minimum starting speed; Priming; specific speed; limitation of suction lift, net positive suction head (NPSH); Performance and characteristic curves; Cavitation effects; Multistage centrifugal pumps; troubles and remedies.

### Text Books:

1. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House 22<sup>nd</sup>, 2019.
2. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2<sup>nd</sup> edition 2018

### Reference Books:

1. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P)Ltd., New Delhi 11<sup>th</sup> edition, 2024.
2. Fluid Mechanics by Frank M. White, Henry Xue, Tata McGraw Hill, 9<sup>th</sup> edition, 2022.
3. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010.
4. Introduction to Fluid Mechanics & Fluid Machines by S K Som, Gautam Biswas, S Chakraborty 3<sup>rd</sup> edition 2011

### Web Resources:

1. <https://nptel.ac.in/courses/105105203>
2. <https://archive.nptel.ac.in/courses/112/106/112106300/>
3. <https://archive.nptel.ac.in/courses/112/103/112103249/>

IV SEMESTER	L	T	P	C
	-	-	3	1.5
<b>23CE4L01: CONCRETE TECHNOLOGY LABORATORY</b>				

**Course Objectives**

Upon successful completion of this course, the student will be able to test basic properties of ingredients of concrete fresh and hardened concrete properties.

**Course Outcomes:**

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

- CO1:** Outline importance of testing cement and its properties (**K3**)
- CO2:** Know different properties of Aggregates (**K3**)
- CO3:** Estimate fresh concrete properties and their relevance to hardened concrete (**K3**)
- CO4:** Assess hardened concrete properties (**K3**)

**Syllabus:****1. Tests on Cement**

Normal Consistency and Fineness of cement.  
Initial setting time and Final setting time of cement.  
Specific gravity and soundness of cement.  
Compressive strength of cement.

**2. Tests on Fine Aggregates**

Grading and fineness modulus of Fine aggregate by sieve analysis.  
Specific gravity of fine aggregate  
Water absorption and Bulking of sand.

**3. Tests on Coarse Aggregates**

Grading of Coarse aggregate by sieve analysis.  
Specific gravity of coarse aggregate  
Water absorption of Coarse aggregates

**4. Tests on fresh Concrete**

Workability of concrete by compaction factor method  
Workability of concrete by slump test  
Workability of concrete by Vee-bee test.

**5. Tests on Hardened Concrete**

Compressive strength of cement concrete and Modulus of rupture  
Young's Modulus and Poisson's Ratio  
Split tensile strength of concrete.  
Non-Destructive testing on concrete (for demonstration)

**Web Resources:**

1. <https://ms-nitk.vlabs.ac.in/marine-structures/List%20of%20experiments.html>
2. <https://cs-iitd.vlabs.ac.in/List%20of%20experiments.html>

IV SEMESTER	L	T	P	C
	-	-	3	1.5
<b>23CE4L02: ENGINEERING GEOLOGY LABORATORY</b>				

**Course Objectives:**

The objective of this course is:

- To identify the Megascopic types of Ore minerals & Rock forming minerals.
- To identify the Megascopic types of Igneous, Sedimentary, Metamorphic rocks.
- To identify the topography of the site & material selection.

**Course Outcomes:**

Upon the successful completion of this course, the students will be able to:

**CO1:** Identify Megascopic minerals & their properties.(K2)

**CO2:** Identify Megascopic rocks & their properties.(K2)

**CO3:** Identify the site parameters such as contour, slope & aspect for topography.(K2)

**CO4:** Know the occurrence of materials using the strike & dip problems.(K3)

**LIST OF EXPERIMENTS**

- Physical properties of minerals: Mega-scope identification of
  - Rock forming minerals – Quartz group, Feldspar group, Garnet group, Micagroup & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc...
  - Ore forming minerals–Magnetite, Hematite, Pyrite, Pyralusite, Graphite,Chromite, etc.
- Megascopic description and identification of rocks.
  - Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc.
  - Sedimentary rocks – Sand stone, Ferruginous sand stone, Lime stone, Shale, Laterite, Conglomerate, etc.
  - Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite & Biotiteschist, Marble, Khondalite, etc.
- Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
- Simple Structural Geology problems.
- Bore hole data.
- Strength of the rock using laboratory tests.
- Field work – To identify Minerals, Rocks, Geomorphology & Structural Geology.

**Lab Examination Pattern:**

1. Description and identification of FOUR minerals
2. Description and identification of FOUR (including igneous, sedimentary and metamorphic rocks)
3. ONE Question on Interpretation of a Geological map along with a geological section.
4. TWO Questions on Simple strike and Dip problems.
5. Bore hole problems.
6. Project report on geology.

**Reference Books:**

1. 'Applied Engineering Geology Practicals' by M T Mauthesha Reddy, New Age International Publishers, 2<sup>nd</sup> Edition.
2. 'Foundations of Engineering Geology' by Tony Waltham, Spon Press, 3<sup>rd</sup> edition, 2009.

**Web resources:**

1. <https://mg-nitk.vlabs.ac.in/List%20of%20experiments.html>

IV SEMESTER	L	T	P	C
	-	1	2	2
<b>23CE4S01: REMOTE SENSING AND GIS</b>				

**Course Objectives:**

The course is designed to

- Introduce the basic principles of Remote Sensing and GIS techniques and its application to Civil Engineering.
- Learn various types of sensors and platforms and understand the principles of spatial analysis techniques in GIS.
- Introduce GIS software to understand the process of digitization, creation of thematic map from topo sheets and maps.

**Course outcomes**

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

- CO1:** Acquire knowledge about concepts of remote sensing, sensors and their characteristics. **(K2)**
- CO2:** familiarize with data models and data structures to introduce various Raster and Vector Analysis capabilities in GIS. **(K2)**
- CO3:** digitize and create thematic map and extract important features to calculate geometry. **(K3)**
- CO4:** perform surface analysis over Contour to develop digital elevation model. **(K3)**
- CO5:** use GIS software to perform simple analysis in water resources and transportation engineering. **(K3)**

**Syllabus:****UNIT – I**

**Introduction to Remote sensing:** History of Remote Sensing, Electromagnetic Radiation, Electromagnetic Spectrum, Energy Interaction with Atmosphere, Energy Interaction with the Earth Surfaces - Characteristics of Remote Sensing Systems, Sensor Resolutions, Advantages & Limitations - Platforms: Types of Sensors, Airborne Remote Sensing, Spaceborne Remote Sensing - IRS, LANDSAT, SPOT & Recent satellite.

**UNIT – II**

**Digital Image analysis:** Digital Image Characteristics, Digital Image Data Formats, Band Interleaved by Pixel (BIP), Band Interleaved by Line (BIL), Band Sequential (BSQ) - Visual Interpretation Elements, Preprocessing, Enhancement, Classification, Supervised classification, Unsupervised classification.

**UNIT – III**

**Introduction to Geographic Information System:** Principles, Components and Applications of GIS - Map projections, Spatial Data Structures, Raster and Vector Data Formats, Data Inputs, Data Manipulation, Data Retrieval, Data Analysis - Spatial data analysis: Overlay Function-Vector Overlay Operations, Raster Overlay Operations, Arithmetic Operators, Comparison and Logical Operators, Conditional Expressions - Network Analysis: Components of network, Transportation network - Optimum path analysis.

**Text Books:**

1. BasudebBhatta (2021). 'Remote sensing and GIS', 3<sup>rd</sup>edition, Oxford University Press.
2. S. Kumar, (2016) 'Basics of Remote sensing & GIS', Laxmi Publications.
3. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2022) 'Remote Sensing and Image Interpretation', 7<sup>th</sup> edition., Wiley India Pvt. Ltd.
4. Demers, M.N, (2013) 'Fundamentals of Geographic Information Systems', 4<sup>th</sup> edition.,Wiley India Pvt. Ltd.

**List of Experiments:**

- Expt. 1: Georeferencing a Toposheet or Map
- Expt. 2: Digitization and Attribute table creation.
- Expt. 3: Creation of Thematic Map
- Expt. 4: Calculation of Feature geometry – Length, Area & Perimeter.
- Expt. 5: Contour map – developing TIN & DEM from Contour.
- Expt. 6: Stream network – Stream ordering map.
- Expt. 7: Watershed - calculate Hydro-geomorphological parameters.
- Expt. 8: Transportation Network Map – Route analysis.

**GIS Software:** QGIS / ArcGIS

**Text Book for Practical**

1. QGIS User Guide
2. Arc GIS User Manual by ESRI

**Reference Books:**

1. Schowengerdt, R. A (2006) 'Remote Sensing', Elsevier publishers.
2. Burrough P A and R.A. McDonnell, (1998) 'Principals of Geographical Information Systems', Oxford University Press.
3. George Joseph (2013) 'Fundamentals of Remote Sensing', Universities Press.

**Web References:**

1. <https://nptel.ac.in/courses/10510319>



IV SEMESTER	L	T	P	C
	1	-	2	2
<b>23CE4Z01: DESIGN THINKING &amp; INNOVATION</b>				

**Course Objectives:** The objectives of the course are to

- Bring awareness on innovative design and new product development.
- Explain the basics of design thinking.
- Familiarize the role of reverse engineering in product development.
- Train how to identify the needs of society and convert into demand.
- Introduce product planning and product development process.

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

**CO1:** Define the concepts related to design thinking. **(K1)**

**CO2:** Explain the fundamentals of Design Thinking and innovation. **(K2)**

**CO3:** Apply the design thinking techniques for solving problems in various sectors. **(K3)**

**CO4:** Analyse to work in a multidisciplinary environment. **(K4)**

**CO5:** Evaluate the value of creativity. **(K5)**

### Syllabus:

#### UNIT – I Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

#### UNIT – II Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

**Activity:** Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

#### UNIT - III Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

**Activity:** Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

#### UNIT - IV Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

**Activity:** Importance of modeling, how to set specifications, Explaining their own product design.

#### UNIT – V Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

**Activity:** How to market our own product, about maintenance, Reliability and plan for startup.

**Textbooks:**

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

**Reference Books:**

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

**Web Resources:**

1. <https://nptel.ac.in/courses/110/106/110106124/>
2. <https://nptel.ac.in/courses/109/104/109104109/>
3. [https://swayam.gov.in/nd1\\_noc19\\_mg60/preview](https://swayam.gov.in/nd1_noc19_mg60/preview)
4. [https://onlinecourses.nptel.ac.in/noc22\\_de16/preview](https://onlinecourses.nptel.ac.in/noc22_de16/preview)

IV SEMESTER	L	T	P	C
	3	-	-	-
23CE4M01:BUILDING MATERIALS AND CONSTRUCTION				

**Course Outcomes:**

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

**CO1:** reproduce knowledge towards civil engineering materials like stones, bricks, tiles in building construction. **(K1)**

**CO2:** explain about stone masonry, wood in building construction. **(K2)**

**CO3:** interpret the application of lime, cement and the importance in construction field. **(K2)**

**CO4:** prepare building components like lintels, arches, vaults, staircases. **(K3)**

**CO5:** discuss various finishings in building construction. **(K2)**

**Syllabus:****UNIT-I**

**Stones, Bricks And Tiles :** Properties of building stones - relation to their structural requirements, classification of stones - stone quarrying - precautions in blasting, dressing of stone, composition of good brick earth, various methods of manufacturing of bricks. Characteristics of good tile - manufacturing methods, types of tiles. Uses of materials like Aluminum, Gypsum, Glass and Bituminous materials - their quality.

**UNIT-II**

**Masonry:** Types of masonry, English and Flemish bonds, Rubble and Ashlar Masonry Cavity and partition walls.

**Wood:** Structure – Properties - Seasoning of timber - Classification of various types of woods used in buildings - Defects in timber. Alternative materials for wood- Galvanized Iron, Fiber-Reinforced Plastics.

**UNIT-III**

**Lime And Cement:** Lime: Various ingredients of lime - Constituents of lime stone -classification of lime - various methods of manufacture of lime.

**Cement:** Portland cement- Chemical Composition-Hydration, setting and fineness of cement- Various types of cement and their properties- Various field and laboratory tests for Cement. Various ingredients of cement concrete and their importance- various tests for concrete.

**UNIT-IV**

**Building Components:** Lintels, arches, vaults, stair cases - types. Different types of floors - Concrete, Mosaic, Terrazzo floors, Pitched, flat roofs. Lean to roof, Coupled Roofs. Trussed roofs - King and Queen post Trusses. R.C.C Roofs, Madras Terrace and Pre-fabricated roofs.

**UNIT-V**

**Finishings:** Damp Proofing and water proofing materials and uses- Plastering Pointing, white washing and distempering - Paints: Constituents of a paint - Types of paints – characteristics of paints- Painting of new/old wood- Varnish-form Works and Scaffoldings.

**Text Books:**

1. Building Materials by S.S.Bhavikatti, Vices publications House private Ltd.
2. Building Construction by S.S.Bhavikatti, Vices publications House private Ltd.
3. Building Materials by B.C. Punmia, Laxmi Publications private Ltd.
4. Building Construction by B.C.Punmia, Laxmi Publications (p) Ltd.

**Reference Books:**

1. Building Materials by S.K.Duggal, New Age International Publications.
2. Building Materials by P.C.Verghese, PHI learning (P) Ltd.
3. Building Materials by M.L.Gambhir, Tata Mc Graw Hill Publishing Co.Ltd. New Delhi.
4. Building construction by P.C.Verghese, PHI Learning (P) Ltd.

**Web Resources:**

1. <https://nptel.ac.in/courses/105102088>
2. <https://archive.nptel.ac.in/courses/105/106/105106206/>