DAYANANDA SAGAR UNIVERSITY

School of Engineering

Devarakaggalahalli, Harohalli, Bengaluru – 562 112

BACHELOR OF TECHNOLOGY (B. Tech.) PROGRAMME

FIRST YEAR

ACADEMIC YEAR: 2023-24

PART-A

GOVERNING REGULATIONS FOR BACHELOR OF TECHNOLOGY (B. Tech.) 2023-24

PREAMBLE

The School of Engineering under Dayananda Sagar University (DSU) provides Science & Technology based education leading to the development of high calibre engineers suitable for Industry and Scientific Organization. The curriculum focuses on knowledge-based course work integrated with skill development as a part of training. It equally helps in inculcating the scientific temper for the lifelong processes of learning. At the Undergraduate level, a candidate goes through the foundation courses in Science, Humanities & Engineering. Each department ensures that the courses cover both the core & electives courses, as required. Provision for Institutional elective help the candidates to acquire interdisciplinary knowledge base or specialize significantly in an area outside the parent discipline.

DEFINITIONS OF KEYWORDS

(i) **Academic Year:** Two consecutive odd, even semesters and a summer term for make up if required.

(ii) **Course:** Usually referred to as a subject, a course may consist of any of Lecture/Tutorials/Practical /Seminar/Mini project/Project work.

(iii) **Credit:** A unit by which the course work is measured. One credit is equivalent to one hour of lecture or one hour of tutorial or two hours of laboratory/practical/ workshop practice per week.

(iv) **Credit Point:** It is the product of grade point and number of credits per course.

(v) **Cumulative Grade Point Average (CGPA):** It is the measure of overall cumulative performance over all semesters. It is expressed up to two decimal places.

(vi) **First Attempt:** If a candidate has completed all formalities of academic requirement in a term and become eligible to attend the examinations and attend all the end semester examinations, such attempt shall be considered as first attempt.

(vii) **Grade Point:** It is a numerical weight allotted to each letter grade on a 10-point scale.

(viii) **Letter Grade:** It is an index of the performance in a said course. Grades are denoted by alphabets.

(ix) **Programme:** An educational activity leading to award a degree or Certificate.

(x) **Semester Grade Point Average:** It is a measure of performance during a semester. It shall be expressed up to two decimal places.

(xi) **Transcript:** Based on the grades earned, a grade certificate shall be issued after every semester to the candidate registered.

(xii) **Failure:** It is the case of appearing for Semester End Examinations but fails to obtain minimum passing marks in Semester End Examinations.

(xiii) **Detain**: It is the case of not satisfying the eligibility criteria w.r.t Attendance /Internal Assessment in each course to appear for Semester End Examination.

(xiv) **Audit Course:** A course to be taken by the student without benefit of a grade or a credit.

(xv) **Not Fit For The Program (NFFTP)**: It is the failure of satisfying the criteria laid down by regulations to continue the program of study, which leads to the termination from the University

RULES AND REGULATIONS

UG 1. All B.Tech programmes offered by the University shall be governed by the DSU B.Tech Rules and Regulations – 2023.

UG 2. The B. Tech. rules and regulations shall be applicable to any new discipline(s) that may be introduced in future.

UG 3. A candidate shall become eligible for the award of the B.Tech. Degree after fulfilling all the academic requirements as prescribed by the B.Tech. Rules and Regulations of DSU.

UG 4. ELIGIBILITY FOR ADMISSION

UG 4.1. Admission to First Year Bachelor of Technology shall be open to candidates who have passed the second year Pre-University or XII standard or equivalent examination recognized by the University.

UG 4.2. The candidate shall have studied and passed English as one of the courses and secured not less than forty five percent (45%) marks in aggregate with Physics and Mathematics as compulsory courses, along with any one of the following courses, namely, Chemistry, Bio- Technology, Computer Science, Biology and Electronics. Eligibility shall be 40% in optional courses in case of candidates belonging to SC/ST and OBC candidates from Karnataka.

UG 4.3. Admission to II year /III Semester Bachelor of Technology under Lateral entry shall be open to the candidates who have passed diploma or equivalent qualification as recognized by statutory and regulatory body.

UG 4.4. For candidates who have completed Diploma from other than State of Karnataka, their eligibility shall be based on the recognition of the Diploma awarding Boards by the University.

UG 4.5. Diploma candidates seeking admission under Lateral entry shall take up bridge courses as prescribed in the Scheme of Teaching.

UG 4.6. Admission to II year /III Semester Bachelor of Technology shall be open to candidates who have passed B. Sc. degree from a recognized University or equivalent as recognized by the University and secure not less than 45% marks in aggregate (including all semesters). Eligibility shall be 40% in case of candidates belonging to SC/ST and OBC candidates from Karnataka.

UG 4.7. B.Sc. Graduates seeking admission under Lateral entry shall take up bridge Courses as prescribed in the Scheme of Teaching.

UG 5. ACADEMIC SESSION

UG 5.1. Each academic session is divided into two semesters of approximately sixteen Weeks duration and a summer term: an odd semester (August -December), an even semester (January - May) and summer term (Make-up term) June-July.

UG 5.2. The approved schedule of academic activities for a session, inclusive of dates for registration, mid-semester and end-semester examinations, vacation breaks, shall be laid down in the Academic Calendar for the session.

UG 6. CHANGE OF BRANCH

UG 6.1. Normally a candidate admitted to a particular branch of the undergraduate programme will continue studying in that branch till completion.

UG 6.2. However, in special cases, the University may permit a candidate to change from one branch of studies to another after the first two semesters. Such changes will be permitted, in accordance with the provisions laid down hereinafter.

UG 6.3. Only those candidates will be considered eligible for change of branch after the second semester, who have completed all the credits required in the first two semesters of their studies in their first attempt, without having to pass any course requirement in the summer term examination.

UG 6.4. Applications for a change of branch must be made by intending eligible candidates in the prescribed form. The academic section will call for applications at the end of second semester of each academic year and the completed forms must be submitted by the last date specified in the notification.

UG 6.5. Candidates may enlist their choices of branch, in order of preference, to which they wish to

change over. It will not be permissible to alter the choices after the application has been submitted.

UG 6.6. Change of branch shall be made strictly in the order of merit of the applicants. For this purpose, the CGPA obtained at the end of the second semester shall be considered. In case of a tie, SGPA of second semester followed by SGPA of first semester shall decide the tie.

UG 6.7. The applicants may be allowed a change in branch, strictly in order of merit, course to the limitation that the strength of a branch should not fall below the existing strength by more than ten percent and should not go above the sanctioned strength by more than ten percent. The minimum class strength of 75% should be maintained, while considering the change of branch.

UG 6.8. All changes of branch made in accordance with the above rules shall be effective from the third semester of the applicants concerned. No change of branch shall be permitted after this.

UG 7. COURSE STRUCTURE

UG 7.1. Medium of instruction, examination and project reports shall be in English except in case of any language audit courses.

UG 7.2. Teaching of the courses shall be reckoned in credits: Credits are assigned to the Courses based on the following general pattern:

(a) One credit for each lecture period.
(b) One credit for each tutorial period.
(c) One credit per two hours for each Laboratory or Practical or workshop session.
(d) Credits for seminar, mini project, project as indicated in the scheme/curriculum of teaching.

UG 7.3. In order to qualify for a B. Tech. degree of the University, a candidate is required to complete the credit requirement as prescribed in the scheme/curriculum for a particular programme.

UG 7.4. The program of a study consists of the following components:

(i) Humanities and Social Sciences including Management courses
(ii) Basic Science courses
(iii) Engineering Science courses
(iv) Professional core courses
(v) Open Electives
(vi) Project work, seminar and internship
(vii) Mandatory/Audit Courses

UG 7.5. Every B. Tech. Programme shall have a curriculum and syllabi for the courses approved by the Board of Governors. Board of Studies will discuss and recommend the syllabi of all the undergraduate courses offered by the department from time to time before sending the same to the Academic Council. Academic Council will consider the proposals from the Board of Studies and make recommendations to the Board of Management and Board of Governors for consideration and approval. For all approved courses, the copyright shall be with DSU.

UG 7.6. Faculty Advisor: To help the candidates in planning their courses of study and getting general advice on the academic programme, the concerned department will assign a Faculty Advisor to each candidate.

UG 8. REGISTRATION

UG 8.1. Every candidate is required to register for approved courses through the assigned Faculty Advisor at the end of previous semester or first week of the current semester, as notified by the Academic Calendar.

UG 8.2. The Dean may cancel the registration of one or more courses if they are found to violate some rules or if there are restrictions imposed due to disciplinary reasons.

UG 8.3. The student is permitted to drop a course/s from the registered courses, within 4 weeks after the start of the Semester/Year as notified in the academic calendar, with the permission of Faculty Advisor and Chairperson / Dean / Principal of the respective School/College and no mention will be made in the grade card for dropped courses.

UG 8.4. The student is permitted to withdraw course/s from the registered courses, within 4 weeks before the start of the Semester/Year End Examinations as notified in the academic calendar, with the permission of Faculty Advisor and Chairperson / Dean / Principal of the respective School / College and Grade "W" will be awarded for course/s that were withdrawn.

UG 8.5. For the courses with "W" grade, the students should re-register subsequently when offered, either in MOOCS or in-class or summer term and fulfil the passing criteria to secure a grade in that course for change from "W" grade.

UG 8.6. Only those candidates shall be permitted to register who have:

(a) The academic eligibility to move to higher semesters (UG 9 & UG 11)
(b) Cleared all University, Hostel and Library dues and fines (if any) of the previous semesters,
(c) Paid all required advance payments of University and Hostel dues for the current semester,
(d) Not been debarred from registering on any specific ground.
(e) A minimum CGPA of 4 in the previous semesters

UG 9. EXAMINATION: ASSESSMENT CRITERIA & ELIGIBILITY FOR PROGRESSION

Every student shall be assessed for eligibility to higher semester through Continuous Internal Assessment (CIA) and Semester End Examination (SEE) as prescribed.

UG 9.1. The Continuous Internal Assessment (CIA) shall normally be conducted by the assessment components spread through the running semester; the components of CIA may be tests, mid-term exam, quiz, term paper, simulation based problem solving, open-book test, solving open-end problems, mini- projects, seminars, viva-voce, awarding marks for attendance and such activities that enhance original thinking of students. The Course instructor shall announce the detailed methodology for conducting the various components of CIA together specifying component-wise weightages right in the commencement of each semester.

UG 9.2. The Semester End Examinations (SEE) shall be conducted at the end of each semester. The SEE components may be a closed or open book examination, project demo, viva-voce, and/or a portfolio presentation.

UG 9.3. CIA and SEE shall respectively have 60:40 percent weightage. The Vice- Chancellor, on the recommendations of the Dean of Faculty and Department Chair, in exceptional cases, may approve the variation in this weightage ratio.

UG 9.4. The performance of a student with respect to a course in a semester shall be the combined score of marks/points, he/she secures in CIA and SEE, put together. A minimum of securing 40% marks, combining both the CIA with SEE marks secured with respect to a course, shall entail the student a PASS in the course. The Vice-Chancellor, in such cases where the entire class has fared poorly in the course, upon receiving a representation by the students / department, and based on the recommendations of the committee constituted for the purpose, may review the criterion of 40%.

UG 9.5. ATTENDANCE ELIGIBILITY

UG 9.5.1. Candidates are required to attend all the classes (Lectures, Tutorials, Practical, Workshop Practice, etc.) for which they have been registered.

UG 9.5.2. The candidate shall not be allowed to appear for the end semester examination if his/her

attendance falls below 85% in each course and shall be awarded a "NE" grade in that course.

UG 9.5.3. A provision for condonation of 10% of the attendance by the Vice-Chancellor on the specific recommendation of the chairman of the department and Dean, showing reasonable cause such as:

(a) Any medical emergencies/ illness where the candidate requires rest for the specified number of days certified by a Government Doctor only /any death in the family (near and dear ones).

(b) If the student represents the University in Sports/ Cultural Activities/Extra-curricular activities/Co-curricular activities.

(c) If a student presents a Paper in National/ International Conferences or attends any recognized Workshops/Seminars.

UG 9.5.4. If the period of leave is for a short duration (less than two weeks), prior application for leave shall have to be submitted to the Chairman of the Department concerned stating fully the reasons for the leave requested for along with supporting document(s). Such leave will be granted by the Chairman of the Department. However, the student shall comply with 9.5.2 and 9.5.3. of regulations.

UG 9.5.5. If the period of absence is likely to exceed two weeks, a prior application for grant of leave will have to be submitted through the Chairman of the Department to the Dean with supporting documents in each case. The decision to grant leave shall be taken by the Dean on the recommendation of the Chairman of the Department. However the student shall comply with 9.5.2 and 9.5.3.of regulations.

UG 9.5.6. It shall be the responsibility of the candidate to intimate the concerned course instructor(s) regarding his/her absence before availing the leave.

UG 9.6. CONTINUOUS INTERNAL ASSESSMENT

UG 9.6.1. Candidates shall participate in all components of Continuous Internal Assessment (CIA) to become eligible to take up the Semester End Examination or else 'NE' grade shall be awarded. However, the Vice-Chancellor, under exceptional circumstances on the recommendations of the Dean of Faculty and Department Chair, may exempt a student from participation in CIA component/s and permit taking up SEE.

UG 9.6.2. There shall be no marked improvement of Continuous Internal Assessment; however, the withdrawal and re-registering of the course shall be permitted.

UG 9.6.3. Continuous Evaluation consists of:

UG 9.6.3.1. Under normal circumstances for theory courses, total CIA weightage shall be a total of 60%, put together all components with varying weightages; Under exceptional circumstances with the approval of the Vice-Chancellor on the recommendation of the Dean of the School, the weightage of CIA may be lower/higher than 60%.

The components of CIA may be tests, mid-term exam, quiz, term paper, simulation based problem solving, open-book test, solving open-end problems, mini-projects, seminars, viva-voce, awarding marks for attendance and such activities that enhance original thinking of students.

UG 9.6.3.2 Under normal circumstances for the practical courses (laboratory, workshops, and any such hands-on activity), total CIA weightage shall be a total of 60%, put together all components with varying weightages; Under exceptional circumstances with the approval of the Vice-Chancellor on the recommendation of Dean of the School, the weightage of CIA may be lower/higher than 60%.

CIA may have components such as conduction of an experiment, record writing, viva-voce, tests, simulation, mid-term exam, quiz, demo, term paper, mini-projects, seminars, marks for attendance and activities which enhances original thinking of students.

UG 10. GRADING

UG 10.1 There shall be continuous assessment of a candidate's performance throughout the semester and grades shall be awarded by the concerned course instructor and/or the appropriate committee appointed for this purpose on the following basis.

UG 10.2 The grading will normally be based on CIA and SEE.

UG 10.3. Practical Courses/ Workshop Practice: The evaluation will be based on instructor's continuous internal assessment, a test and end semester examination.

UG 10.4. The weightage assigned to different components of continuous internal assessment will be announced by the concerned instructor(s) in the beginning of the semester.

UG 10.5. The results of performance of the candidates in the Continuous Internal assessment Test shall be announced by the instructors.

UG 10.6. In case of seminar, evaluation will be as determined by the grade awarding Committee (as per the Program scheme).

UG 10.7. Mini project /projects will be based on Continuous evaluation by Guide(s) and Semester End Examination (as per the Program scheme)

UG 10.8. The results of performance of the candidates shall be announced by the Controller of Examinations.

UG 10.9. METHOD OF AWARDING LETTER GRADES

UG 10.9.1. Relationships among Grades, Grade points and % of marks are listed in Table1.

UG 10.10. DESCRIPTION OF GRADES

UG 10.10.1 Table 1 shows the relationships among the grades, grade points and percentage of marks.

Table 1: Grade, Points, Grade Description and % of marks

GRADE	GRADE POINTS	DESCRIPTION	% MARKS
O	10	Outstanding	90 to 100
A+	9	Excellent	80 to 89
A	8	Very Good	70 to 79
B+	7	Good	60 to 69
B	6	Above Average	55 to 59
C	5	Average	50 to 54
P	4	Pass	40 to 49
F	0	Fail	< 40
AP	-	Audit Pass	-
AF	-	Audit Fail	-
IC	-	In Complete	-
NE	-	Not Eligible	-
W	-	Withdrawn	-

UG 10.10.2. A student will have to ensure a minimum CGPA of 4, to become eligible for the award of the degree.

UG 10.10.3. A candidate shall have to repeat all courses in which he/she obtains 'F' Grades until a passing grade is obtained.

UG 10.10.4. An IC grade denotes incomplete performance in any Theory and/or Practical Assessment. It may be awarded in case of absence on medical grounds or other special circumstances for SEE. Requests for IC grade should be made at the earliest but not later than the last day of SEE.

UG 10.10.5. The student can appear for the course/s with IC grade, when exams are conducted subsequently by the University for those Courses.

UG10.11. EVALUATION OF PERFORMANCE

UG10.11.1. The performance of a candidate shall be evaluated in terms of the Semester Grade Point Average (SGPA) which is the Grade Point Average for a semester, Cumulative Grade Point Average (CGPA) which is the Grade Point Average for all the completed semesters.

UG 10.11.2. The Earned Credits (EC) are defined as the sum of course credits for courses in which candidates have been awarded grades between O to P. (Table 1)

UG 10.11.3. Points earned in a semester = (Course credits X Grade point) for Grades O - P

UG 10.11.4. The SGPA is calculated on the basis of grades obtained in all courses, except audit courses and courses in which F grade or below, registered for in the particular semester.

$$\text{SGPA} = \frac{\text{Points secured in the semester (O} - \text{P Grades)}}{\text{Credits registered in the semester, excluding audit}}$$

UG 10.11.5. The CGPA is calculated on the basis of all pass grades, except audit courses.

$$\text{CGPA} = \frac{\text{Cumulative points secured in all the passed courses (O} - \text{P Grades) Cumulative}}{\text{registered credits, excluding audit}}$$

UG 10.12. WITHHOLDING OF GRADES

UG 10.12.1. Grades shall be withheld when the candidate has not paid his/her dues or when there is a disciplinary action pending against him/her.

UG 10.13. CONVERSION OF CGPA INTO PERCENTAGE

UG 10.13.1. Conversion formula for the conversion of CGPA into percentage is Percentage of Marks Scored = (CGPA Earned − 0.75) × 10

UG 11. PROMOTION CRITERIA AND ENROLLMENTS TO HIGHER SEMESTERS

UG 11.1. During registration to the higher semesters, the following criteria/conditions for promotion, shall be satisfied.

UG 11.1.1. A student shall 'Not Eligible' (NE) for writing SEE if he/she does not comply to the minimum prescribed attendance in any course that carry a credit.

Students shall register afresh for such course/s, whenever offered next, to meet the attendance requirements and secure a pass grade, subsequently in that course/s.

UG 11.1.2. In a semester (ODD / EVEN), a student is deemed to be Not Eligible (NE) if he/she does not satisfy minimum attendance requirements criteria in a credit course.

If this course happens to be a prerequisite to a connected course in the subsequent semester, then the student shall not be permitted to register for that connected course until he / she secures pass grade in the prerequisite course by complying to the minimum attendance requirement when the prerequisite course is offered next (either during summer term or regular semester).

UG 11.1.3. A student shall be permitted to register for FOUR credited courses or to a total of 16 credits whichever is higher along with pending audit courses, if any, during a summer term by paying the prescribed course registration fee per credit notified by the university from time to time.

UG 11.1.4. The students with NE ('NOT ELIGIBLE' due to shortage in attendance) in any Credit Course/s other than Audit Courses in a semester shall have to secure a pass grade by compliance to minimum attendance requirements in the NE course to register for connected courses if NE course happens to be prerequisite course for those connected courses offered in the subsequent semesters.

UG 11.1.5. Candidates who secure 'F' grade in any courses in regular semester or summer term shall secure PASS grade in such course/s either in the subsequent summer term examination or shall repeat in the next appropriate semester whenever it is/they are offered, i.e. odd semester courses during odd semesters examinations and even semester courses during even semester examinations, respectively.

UG 11.2. In case of failure in Practical/Workshop practice course the candidate in any semester may clear it in the subsequent summer term examination or semester examination.

UG 11.3. In case a candidate fails in Practical/ Workshop practice he/she shall register when it is offered next either in the summer term or subsequent semester, as the case may be.

UG 11.4. Candidates may add and drop course(s) with the concurrence of the Faculty Advisor, and under intimation to the concerned course instructors and the academic section provided this is done within the date mentioned in the Academic Calendar.

UG 11.5. SUMMER TERM & MAKEUP EXAMINATIONS

UG 11.5.1. A summer term program may be offered by a department and with the approval of the Dean.

UG 11.5.2. Summer term courses will be announced by the Academic Affairs Office at the end of the even semester and before the commencement of the end semester examination. A candidate will have to register for summer term courses by paying the prescribed fees within the stipulated time in the announcement.

UG 11.5.3. The total number of contact hours in any summer term program will be the same as in the regular semester course. The assessment procedure in a summer term course will also be like the procedure for a regular semester course.

UG 11.5.4. Candidates granted semester drop by the Board of Governors, on medical ground, shall be allowed to clear the concerned courses in summer term course and subject to conditions as stated under clauses 11.5.1, 11.5.2.and 11.5.3.

UG 11.5.5. The Candidates with "NE" grade shall register for summer term by paying the prescribed fees.

UG 11.5.6. Candidates who are awarded 'F' grades in regular semester examinations have the option to register for the concerned courses in summer term examinations to the conditions as stated under clauses 11.5.1, 11.5.2.and 11.5.3 above, or they can re-sit for subsequent semester/summer term examination only.

UG 11.5.7. Provision for make-up exam shall be available to the students who might have missed to attend the Semester / Annual end examinations of one or more courses for exceptional cases

arising out of natural calamities / medical emergencies / death of a member in the family, with the permission of Faculty Advisor and Chairperson / Dean / Principal of the respective School/College. All such cases have to be exclusively to be approved by the Vice-Chancellor and ratified in the Academic Council / BOM / BOG. All such courses approved for makeup examinations are awarded a transitory grade "IC" (incomplete grade)

UG 11.5.8. The makeup examinations shall be held as notified in the academic calendar or through an exclusive notification duly approved by the Vice-chancellor.

UG 12. DURATION OF THE PROGRAMME

UG 12.1. Normally a candidate should complete all the requirements for an undergraduate programme in four years. However, academically weaker candidates who do not fulfill some of the requirements in their first attempt and have to repeat them in subsequent semesters may be permitted up to eight consecutive years (from the first year of registration) to complete all the requirements of the degree.

UG 12.2. Normally a candidate under lateral entry should complete all the requirements for undergraduate programme in three years. However, academically weaker candidates who do not fulfill some of the requirements in their first attempt and have to repeat them in subsequent semesters may be permitted up to six consecutive years (from the second-year registration) to complete all the requirements of the degree.

UG 13. TERMINATION FROM THE PROGRAMME

UG 13.1. A candidate may also be compelled to leave the Program in the University on disciplinary grounds.

UG 13.2. On having been found to have produced false documents or having made false declaration at the time of seeking admission.

UG 13.3. On having been found to be pursuing regular studies and/or correspondence courses (leading to degree or diploma) in any other college, university, or an educational institution simultaneously.

UG 13.4. On having been found to be concurrently employed and performing duty or carrying out business in contravention to academic schedules of the University and without seeking approval from the University.

UG 13.5. If a student fails to earn a pass grade even after 4 attempts such a student is terminated from the university on the grounds of NOT FIT FOR THE PROGRAM (NFFTP).

UG 13.6. If a student secures a CGPA less than 4.0, 4 times during the entire duration of the program of study, such a student is terminated from the university on the grounds of NOT FIT FOR THE PROGRAM (NFFTP).

UG 13.7. However, if the student appeals for reconsideration of termination from the university under NFFTP rule by providing the guanine reasons to the Vice- Chancellor through the Dean of Faculty, then the Vice-Chancellor may consider constituting a committee for the purpose of review and provide 2 additional attempts on the recommendations of the committee.

UG 14. TEMPORARY WITHDRAWAL FROM THE UNIVERSITY

UG 14.1. Candidate who has been admitted to an undergraduate programme of the University may be permitted to withdraw temporarily from the University on the grounds of prolonged illness or grave calamity in the family for a period of one semester or more, provided:

UG 14.1.1. He/she applies to the University within at least 6 weeks of the commencement of the semester or from the date he last attended his/her classes whichever is later, stating fully the reasons for such withdrawal together with supporting documents and endorsement of his/her guardian.

UG 14.1.2. The University is satisfied that, counting the period of withdrawal, the candidate is likely to complete his/her requirements of the B. Tech. Degree within the time limits specified in Clause 12.1 or 12.2 above.

UG 14.1.3. There are no outstanding dues or demands in the University/Hostel/Department/ Library.

UG 14.1.4. Normally, a candidate will be permitted only one such temporary withdrawal during his/her tenure as a candidate of the undergraduate programme.

UG 15. TRANSFER OF CANDIDATES

UG 15.1. Transfer of candidates from higher education institutions outside university shall be considered at the beginning of Third and Fifth Semesters but subject to confirmation of equivalence.

UG 15.2. The candidates shall apply for equivalence with the No-objection for admission to DSU from the University where they are perusing their study.

UG 15.3. The candidates must have passed in all courses in the earlier semesters prior to transfer.

UG 16. ELIGIBILITY FOR THE AWARD OF B. Tech. DEGREE

A candidate shall be declared to be eligible for the award of B. Tech. degree if he/she has:

UG 16.1. Completed all the credit requirements for the degree with a CGPA 4.0 or higher at the end of the programme.

UG 16.2. Satisfactorily completed all the mandatory audit courses.

UG 16.3. No dues to the University, Department, Hostels.

UG 16.4. No disciplinary action pending against him/her.

UG 17. AWARD OF DEGREE

The award of B. Tech. degree must be recommended by the Academic Council and approved by the Board of Management and Board of Governors of the DSU.

UG 18. CONDUCT AND DISCIPLINE

UG 18.1. Candidates shall conduct themselves within and outside the precincts of the University in a manner befitting the candidates of an institution of national importance. The University has a separate ordinance Code and Conduct of Candidates which is applicable to all candidates of the University.

UG 19. REPEAL AND SAVINGS

Notwithstanding anything contained in these Regulations, the provisions of any guidelines, orders, rules or regulations in force at the University shall be inapplicable to the extent of their inconsistency with these Regulations. The Academic Council, Board of Management and Board of Governors of Dayananda Sagar University may revise, amend or change the regulations from time to time.

UG 20. INTERPRETATION

Any questions as to the interpretation of these Regulations shall be decided by the University, whose decision shall be final. The University shall have the powers to issue clarifications to remove any doubt, difficulty or anomaly which may arise during the implementation of the provisions of these regulations.

PART-B

SCHEME AND SYLLABUS FOR THE FIRST YEAR B.TECH. PROGRAMEE

Definitions / Descriptions

Definition of Credit:	
1 Hour Lecture (L) Per Week	01 Credit
1 Hour Tutorial (T) Per Week	0.5 Credit
1 Hour Practical (P) Per Week	0.5 Credit
1 Hour Project (J) Per Week	0.5 Credit

Course code and Definition:	
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management Courses
IPCC	Integrated Professional Core Course
PCC	Professional Core Courses
PEC	Professional Elective Courses
OEC	Open Elective Courses
SEC	Skill Enhancement Courses
UHV	Universal Human Value Course
PROJ	Project Work
INT	Internship

Implementation of National Education Policy (NEP) 2020 for the B.Tech. students of Batch 2023-24

The implementation of Curriculum follows NEP 2020 and addresses the following features and categories of courses:

1. Student Centric flexible curriculum.
2. Interdisciplinary Courses,
3. Multi-disciplinary Courses,
4. Ability Enhancement Courses,
5. Skill Enhancement Courses,
6. Value Added Courses,
7. Product Design and Development,
8. Internship (Rural Internship, Industry Internship, Research/Development Internship), and
9. Multiple Exit and Multiple Entry

    - Certificate in Engineering after completion of first year.
    - Diploma in Engineering after completion of second year.
    - Advanced Diploma in Engineering after completion of third year.
    - Degree in Engineering after completion of fourth year

S

I SEMESTER (Chemistry Cycle)													
S.N	**Course Type**	**Course Name**	**Teaching Department**	**Specific to Department**	**Teaching Hours / Week**				**Examination**				**C i t s**
					Lecture	**Tutorial**	**Practice**	**Project**	**Duration in Hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
					L	**T**	**P**	**J**					
1	BSC	Linear Algebra and Differential Equations	MAT	All Depts.	3	0	0	0	03	60	40	100	**3**
2	BSC	Engineering Chemistry	CHEM	All Depts.	2	0	2	0	04	60	40	100	**3**
3	ESC	Introduction to Mechanical Engineering	ME	All Depts.	2	0	2	0	04	60	40	100	**3**
4	ESC	Introduction to Electrical Engineering	ECE	All Depts.	2	0	0	0	02	60	40	100	**2**
5	ESC	C Programming for Problem Solving	CSE	All Depts.	2	1	2	0	05	60	40	100	**4**
6	ESC	Engineering Mechanics	ME	All Depts.	2	0	0	0	02	60	40	100	**2**
7	HSMC	Technical English	HUM	All Depts.	1	2	0	0	01	100	--	100	**2**
8	AEC	Environmental Science	Biology	All Depts.	1	0	0	0	01	100	--	100	**1**

9	HSMC	Kannada Kali / Manasu	HUM	All Depts.	1	0	0	0	01	100	--	100	**1**
									Total	**660**	**240**	**900**	**21**

S

II SEMESTER (Physics Cycle)													
S.N	**Course Type**	**Course Name**	**Teaching Department**	**Specific to Department**	**Teaching Hours / Week**				**Examination**				
					Lecture	**Tutorial**	**Practice**	**Project**	**Duration in Hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	**Credits**
					L	**T**	**P**	**J**					
1	BSC	Single and Multivariate Calculus	MAT	All Depts.	3	0	0	0	03	60	40	100	**3**
2	BSC	Engineering Physics	PHY	All Depts.	3	0	2	0	05	60	40	100	**4**
3	ESC	Introduction to Electronics Engineering	ECE	All Depts.	3	0	0	0	03	60	40	100	**3**
4	ESC	Object Oriented Programming	CSE	All Depts.	2	2	2	0	06	60	40	100	**4**
5	ESC	Engineering Graphics and Design Thinking	ME	All Depts.	1	0	4	0	05	60	40	100	**3**
6	AEC	Biology for Engineers	Biology	All Depts.	2	0	0	0	02	100	--	100	**2**
7	HSMC	Constitution of India and Professional Ethics	HUM	All Depts.	1	0	0	0	01	100	--	100	**1**

	Total	**500**	**200**	**700**	**20**

DAYANANDA SAGAR UNIVERSITY

School of Engineering

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S

I SEMESTER (Physics Cycle)													
S.N	**Course Type**	**Course Name**	**Teaching Department**	**Specific to Department**	**Teaching Hours / Week**				**Examination**				
					Lecture	**Tutorial**	**Practice**	**Project**	**Duration in Hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	**Credits**
					L	**T**	**P**	**J**					
1	BSC	Linear Algebra and Differential Equations	MAT	All Depts.	3	0	0	0	03	60	40	100	**3**
2	BSC	Engineering Physics	PHY	All Depts.	3	0	2	0	03	60	40	100	**4**
3	ESC	Introduction to Electronics Engineering	ECE	All Depts.	3	0	0	0	03	60	40	100	**3**
4	ESC	C Programming for Problem Solving	CSE	All Depts.	2	2	2	0	03	60	40	100	**4**
5	ESC	Engineering Graphics and Design Thinking	ME	All Depts.	1	0	4	0	03	60	40	100	**3**

6	AEC	Biology for Engineers	Biology	All Depts.	2	0	0	0	--	100	--	100	**2**
7	HSMC	Constitution of India and Professional Ethics	HUM	All Depts.	1	0	0	0	--	100	--	100	**1**
		Total								**500**	**200**	**700**	**20**

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SCHEME

II SEMESTER (Chemistry Cycle)

S.N	Course Type	Course Name	Teaching Department	Specific to Department	Teaching Hours / Week				Examination				
					Lecture	Tutorial	Practice	Project	Duration in Hours	CIE Marks	SEE Marks	Total Marks	Credits
					L	T	P	J					
1	BSC	Single and Multivariate Calculus	MAT	All Depts.	3	0	0	0	03	60	40	100	3

2	BSC	Engineering Chemistry	CHEM	All Depts.	2	0	2	0	04	60	40	100	**3**
3	ESC	Introduction to Mechanical Engineering	ME	All Depts.	2	0	2	0	04	60	40	100	**3**
4	ESC	Introduction to Electrical Engineering	ECE	All Depts.	2	0	0	0	02	60	40	100	**2**
5	ESC	Object Oriented Programming	CSE	All Depts.	2	1	2	0	05	60	40	100	4
6	ESC	Engineering Mechanics	ME	All Depts.	2	0	0	0	02	60	40	100	**2**
7	HSMC	Technical English	HUM	All Depts.	1	2	0	0	01	100	--	100	**2**
8	AEC	Environmental Science	Biology	All Depts.	1	0	0	0	01	100	--	100	**1**
9	HSMC	Kannada Kali / Manasu	HUM	All Depts.	1	0	0	0	01	100	--	100	**1**
		Total								**660**	**240**	**900**	**21**

LINEAR ALGEBRA & DIFFERENTIAL EQUATIONS

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – I

Subject Code	:	22EN1101	**Credits**	:	03
Hours / Week	:	03 Hours	**Total Hours**	:	39 Hours
L–T–P–S	:	3–0–0–0			

Course Learning Objectives:

This Course will enable students to:

1. **Apply** the method of Gauss elimination to solve systems of linear equations and determine the row echelon form of a matrix
2. **Analyze** vector spaces, subspaces, and their properties to identify linear independence, span, and bases in the context of finite-dimensional vector spaces.
3. **Evaluate** and compute the dimensions of vector spaces by understanding the concepts of rank and nullity
4. **Analyze** the properties and characteristics of linear transformations and their corresponding matrices to gain a deeper understanding of their behaviour and applications.
5. **Utilize** the concepts of eigenvalues and eigenvectors, employing diagonalization techniques to determine the diagonal form of a matrix and its implications in various contexts.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT – I	**08 Hours**

INTRODUCTION:

System of Linear equations. ***(Text Book-1: Chapter 1: 1.1)***
Row reduction and echelon form. ***(Text Book-1: Chapter 1: 1.2)***
Rank of a matrix by row echelon form. ***(Text Book-1: Chapter 4: 4.6)***
Gauss elimination, Inverse of a matrix by Gauss Jordan ***(Text Book-5: Chapter 3: 3.7 and 3.11)***
LU decomposition ***(Text Book-1: Chapter 2: 2.5)***,

UNIT – II	**08 Hours**

Vector spaces – Subspaces ***(Text Book-1: Chapter 4: 4.1)***
Linear independence – Span - Bases and Dimensions -Finite dimensional vector spaces ***(Text Book-1: Chapter 4: 4.3***)
Dimensions, finite dimensional vector spaces ***(Text Book-1: Chapter 4: 4.5)***

UNIT – III	**09 Hours**

Linear transformation - Matrices of linear transformations ***(Text Book-1: Chapter 1: 1.7 and 1.8)***
Vector space of linear transformations – Inner Product, Orthogonal Vectors - Projections ***(Text Book-1: Chapter 6: 6.1, 6.2 and 6.3)***
Gram- Schmidt Orthogonalization process ***(Text Book-1: Chapter 6: 6.4)***

UNIT – IV	**07 Hours**

Introduction to Eigenvalues and Eigenvectors ***(Text Book-1: Chapter 5: 5.1)***
Diagonalization of a Matrix ***(Text Book-1: Chapter 5: 5.3)***

UNIT – V	**07 Hours**

Linear second order ordinary differential equation with constant coefficients (***Text Book-5: Chapter 2***)
Solutions of homogenous and non-homogenous equations ***(Text Book-5: Chapter 2: 2.2 to 2.7***)
Method of variation of parameters ***(Text Book-5: Chapter 2: 2.10***)
Solutions of Cauchy-Euler and Cauchy-Legendre differential equations ***(Text Book-5: Chapter 2: 2.5***)

Course Outcomes:

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

1. **Solve** systems of linear equations using Gauss elimination and determine the inverse of a matrix by applying the Gauss-Jordan method.
2. **Solve** problems involving row reduction and echelon form in linear algebra to demonstrate an understanding of the concepts and their applications in solving systems of linear equations and transforming matrices.
3. **Analyze** matrices and determine their rank by using row echelon form, examining the relationships between rows and columns, and identifying the motives or causes behind the rank.
4. **Apply** LU decomposition techniques to factorize a matrix into lower and upper triangular matrices, illustrating their understanding of the process and its applications.
5. **Apply** the concepts of vector spaces, subspaces, linear independence, span, bases, and dimensions to solve problems related to finite-dimensional vector spaces, applying acquired knowledge and techniques.

Table: Mapping Levels of COs to POs / PSOs

COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	1						1					
CO2	3	2	1		1				1					
CO3	3	2	1		1				1					
CO4	3	2	1						1					
CO5	3	2	1		1				1					

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXT BOOKS:

1. D C Lay, S R Lay and JJ McDonald, Linear Algebra and its Applications, Pearson India, Fifth edition.
2. Linear Algebra and its Applications by Gilbert Strang, 4th Edition, Thomson Brooks/Cole, Second Indian Reprint 2007.
3. Introductory Linear Algebra- An applied first course, Bernard Kolman and David, R. Hill, 9th Edition, Pearson Education, 2011.
4. Thomas' Calculus, George B. Thomas, D. Weir and J. Hass, 2014, 13th edition, Pearson.
5. Advanced engineering mathematics, Erwin Kreyszig, Wiley, London, 1972.

REFERENCE BOOKS:

1. Introduction to Linear Algebra, Gilbert Strang, 5th Edition, Cengage Learning (2015).
2. Higher Engineering Mathematics by B S Grewal, 42nd Edition, Khanna Publishers.
3. Elementary Linear Algebra, Stephen Andrilli and David Hecker, 5th Edition, Academic Press (2016).
4. Contemporary linear algebra, Howard Anton, Robert C Busby, Wiley 2003.
5. Practical Linear Algebra, Farin and Hansford, CRC Press (2013).

E-Resources:

1. https://nptel.ac.in/courses/111101115
2. https://nptel.ac.in/courses/111108066
3. Linear Algebra Basics | Coursera
4. https://nptel.ac.in/courses/111108081
5. https://nptel.ac.in/courses/111106100
6. Differential Equations for Engineers Course (HKUST) | Coursera

Activity Based Learning (Suggested Activities in Class)

1. Introduce the concept of matrix transformations, such as translation, rotation, scaling, and reflection. Provide visual examples and interactive tools that allow students to manipulate shapes and observe the effects of different transformation matrices.
2. Using real-life scenarios or word problems to make the activity of solving linear equations using matrix method.
3. Some real-world scenarios that can be modelled using ODEs, such as population growth, radioactive decay, or chemical reactions that can be discussed and solve using appropriate methods.

ENGINEERING CHEMISTRY

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – I/II

Subject Code	:		**Credits**	: 03
Hours / Week	:	04 Hours	**Total Hours**	: 26 + 26 Hours
L–T–P–S	:	2–0–2–0		

Course Learning Objectives:

This Course will enable students to:

- **Understand** the principles of chemical fuel towards energy production. **Apply** the concept of energy conversion from solar to electric energy in photovoltaic cells.
- **Understand** the basic principles of electrochemistry to measure the potential of redox reactions. **Illustrate** the construction, working, and applications of batteries, and fuel cells as energy storage devices.
- **Understand** the electrochemical theory of corrosion of metals and its prevention by metal finishing techniques.
- **Understand** the synthesis, structure–property relationship, and the applications of commercial polymers.
- **Understand** the different techniques for the purification of sewage water. **Analyse** the impurities present in waste water systems.

Teaching-Learning Process (General Instructions)
These are some of the innovative pedagogical approaches to accelerate the attainment of the various course outcomes.

1. **Lecture method**: Chalk and talk method, and demonstrations may be adopted to achieve the course outcomes.
2. **Interactive Teaching: Active learning** that includes brainstorming, group work, formulating questions, notetaking, and annotating.
3. Show **Video**s to explain and illustrate the various concepts.
4. Encourage **Collaborative** learning in the class.
5. **Problem Based Learning**, may foster students' analytical skills, ability to evaluate, and process the information.
6. Inculcate the culture of research and encourage students to come up with their own creativity.

UNIT – I Chemical Energy Source	**06 Hours**

Fuels: Introduction to energy; Fuels - definition, classification, importance of hydrocarbons as fuels; Calorific value-definition, Gross and Net calorific values (SI units). Determination of calorific value of a solid / liquid fuel using Bomb calorimeter. Numerical problems on GCV&NCV. Petroleum cracking-fluidized catalytic cracking. Reformation of petrol. octane number, cetane number, anti-knocking agents, power alcohol, and Biodiesel. ***(Text Book-1: Module-3)***

Solar Energy: Thermal energy: Photovoltaic cells-Introduction, definition, importance, working of PV cell. Solar grade silicon physical and chemical properties relevant to photo-voltaics, doping of silicon by diffusion technique. ***(Text Book-1: Module-3)***

UNIT – II Energy Science and Technology	**06 Hours**

Electrochemistry and Battery Technology: Single electrode potential - Definition, and sign conventions. Standard electrode potential- Definition. EMF of a cell-Definition, notation and conventions. Reference electrodes– Calomel electrode, Ag/AgCl electrode. Measurement of standard electrode potential. Battery technology: Basic concepts including characteristics of anode, cathode, electrolyte and separator. Battery characteristics. Classification of batteries– primary, secondary and reserve batteries. State of the art Batteries-Construction working and applications of Zn-air, Lead acid battery, Nickel-Metal hydride and Lithium ion batteries. ***(Text Book-2: Module-1)***

Fuel Cells: Introduction to fuel cells, types of fuel cells. Construction, working and application of Methanol-Oxygen fuel cell. ***(Text Book-2: Module-1)***

UNIT – III Corrosion Science and Surface Modification Techniques	**06 Hours**

Corrosion Science: Definition, Chemical corrosion and Electro-chemical theory of corrosion, Types of corrosion, Differential metal corrosion, Differential aeration corrosion (pitting and

water line corrosion), Stress corrosion. Factors affecting the rate of corrosion, Corrosion control: Metal coatings-Galvanization, Tinning and its disadvantages. Cathodic protection of Corrosion: Sacrificial anode method and current impression method. ***(Text Book-2: Module-2)***

Surface Modification Techniques: Definition, Technological importance of metal finishing. Significance of polarization, decomposition potential and over-voltage in electroplating processes. Electroless Plating. Distinction between electroplating and Electroless plating, advantages of electroless plating. Electroless plating of copper. ***(Text Book-2: Module-2)***

UNIT – IV Polymers	**02 Hours**

Polymers: Introduction to polymers, Glass transition temperature, structure and property relationship. Synthesis, properties and applications of Teflon. PMMA. Synthesis, properties and application of silicone rubber. ***(Text Book-1: Module-4)***

UNIT – V Water Technology & Instrumental Methods of Analysis:	**06 Hours**

Water Technology: Impurities in water. Hardness of Water: Types of Hardness and determination of total hardness of water by using disodium salt of ethylenediaminetetraacetic acid method. Alkalinity. Potable water treatment by Electro dialysis and Reverse Osmosis. Water analysis- Biochemical oxygen demand and Chemical oxygen demand. Determination of COD. Numerical problems on COD. Sewage treatment. ***(Text Book-2: Module-5)***

Instrumental Methods of Analysis: Instrumental methods of analysis, Principles of Potentiometry, Conductometry (Strong acid against strong base, weak acid against strong base, mixture of strong acid and a weak acid against strong base).

Course Outcome	**Description**	**Bloom's Taxonomy Level**
At the end of the course the student will be able to:		
1	**Determination** of calorific value of fuels and **apply** the concepts of energy conversion for photovoltaic cells.	L3
2	**Apply** the basic principles of electrochemistry for the construction of energy storage devices.	L3
3	**Implement** the electrochemical theory to **analyze** the concept of corrosion of metals and its prevention by surface modifications.	L3
4	**Apply** the concept of polymerization for the synthesis of polymers and study their structure-property relationship for commercial applications.	L3
5	**Demonstrate** the techniques in the purification of sewage water. **Determine** the hardness and oxygen demand of the provided waste water samples.	L2

Table: Mapping Levels of COs to POs												
COs	**Program Outcomes (POs)**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	3	3	0	0	0	0	0	0	0	0	0
CO2	3	2	2	0	0	0	0	0	0	0	0	0
CO3	3	1	1	0	0	0	0	0	0	0	0	0
CO4	3	1	3	0	0	0	0	0	0	0	0	0
CO5	3	1	3	0	0	0	0	0	0	0	0	0

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

Text Books

1. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN 978- 93-85155-70-3, 2022.
2. Engineering Chemistry - by Chandra Shekara B M and Basavaraju B C, Banbayalu (publications), Bengaluru, 2014, 294 pages.

Reference Books

1. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
2. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.
3. Wiley's Engineering Chemistry (Wiley India), 2nd Edition, 2013, 1026 pages.

E-Resources

1. https://nptel.ac.in/

2. https://swayam.gov.in/

3. https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Electrochemistry/Basics_of_Electrochemistry

Activity Based Learning (Suggested Activities in Class)

1. Analyze research problems by reading research articles, group discussion, and presentations.
2. Demonstration of solution to a problem through experiential learning.
3. Demonstrations using real objects, taking students on an educational tour.

ENGINEERING CHEMISTRY- LABORATORY

Total: 26 Hrs

Volumetric Analysis and Preparations

1. Evaluation of quality of water in terms of total hardness by complexometric titration.
2. Determination of Chemical Oxygen Demand (COD) of the given industrial waste water sample.
3. Determination of alkalinity of the given water sample

Instrumental methods of Analysis

1. Potentiometric titration–Estimation of FAS using standard $K_2Cr_2O_7$ solution.
2. Conductometric estimation of a mixture of a weak and strong acid using standard sodium hydroxide solution
3. Determination of viscosity coefficient of a given liquid
4. Colorimetric estimation of copper in a given solution
5. Determination of pKa of given weak acid.

Reference Books

1. Dayananda Sagar University laboratory manual.
2. J. Bassett, R.C. Denny, G.H. Jeffery, Vogels, Text book of quantitative inorganic analysis, 4th Edition.

SEMESTER	**I/II**					
YEAR	**I**					
COURSE CODE						
TITLE OF THE COURSE	**INTRODUCTION TO MECHANICAL ENGINEERING**					
SCHEME OF INSTRUCTION	L	T	P	J	Total Hours	Credits
	2	-	2	-	26(L)+26(P) = 52	3

COURSE OBJECTIVES:

The course will enable the students to

- Acquire a basic understanding of renewable energy resources and basic concepts of hydraulic turbines.
- Acquire knowledge of various engineering materials and metal joining techniques.

- Acquire essential knowledge of modern manufacturing tools and techniques.
- Acquire knowledge on basics of refrigeration and air-conditioning.
- Explain about the cooling of electronic devices.
- Acquire knowledge of basic concepts of mechatronics and robotics.
- Explain about the electric and hybrid vehicles.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's TaxonomyLevel
CO1	Describe basic concepts of renewable energy resources and power generation	L2
CO2	Distinguish various engineering materials and metal joining techniques	L2
CO3	Demonstrate different modern manufacturing tools and techniques	L3
CO4	Make use of basic concepts of refrigeration and air-conditioning concepts	L3
CO5	Illustrate essential knowledge of basic concepts of mechatronics and robotics	L2
CO 6	Comprehend the important concepts of electric and hybrid vehicles	L2

COURSE CONTENT:	
MODULE 1 Energy Sources and Power Generation	**10 Hrs**
Review of energy sources: Construction and working of Hydel power plant, Thermal power plant, Nuclear power plant, Solar power plant, Tidal power plant, Wind power plant. Principle and Operation of Hydraulic turbines, Pelton Wheel, Francis Turbine and Kaplan Turbine. Working of Centrifugal Pump & reciprocating pump. **Thermodynamics:** System, boundary, surroundings, types of systems, Zeroth law, First and second laws of thermodynamics, Efficiency, COP, Carnot theorem	
MODULE 2 Engineering Materials and Metal Joining Processes	**10 Hrs**
Metals-Ferrous: Tool steels and stainless steels. Non-ferrous /metals: aluminum alloys. **Ceramics-** Glass, optical fiber glass, cermets. **Composites-** Fiber reinforced composites, Metal matrix Composites.	
Smart materials- Piezoelectric materials, shape memory alloys, semiconductors, and super-insulators. **Metal Joining Processes:** Fitting, Sheet metal, Soldering, brazing and Welding: Definitions. Classification and methods of soldering, brazing, and welding. Brief description of arc welding, Oxy- acetylene welding, Introduction to TIG welding and MIG welding.	
MODULE 3 Modern Manufacturing Tools and Techniques	**12 Hrs**

CNC: Introduction, components of CNC, advantages and applications of CNC, CNC Machining centres and Turning Centers Concepts of Smart Manufacturing and Industrial IoT. **Additive Manufacturing:** Introduction to reverse Engineering, Traditional manufacturing vs Additive Manufacturing, Computer aided design (CAD) and Computer aided manufacturing (CAM) and Additive Manufacturing (AM), Different AM processes, Rapid Prototyping, Rapid Tooling, **3D printing:** Introduction, Classification of 3D printing process, Applications to various fields.
MODULE 4 Thermal Systems and Management — **10 Hrs**
Heat in Electronic Devices: Modes of Heat Transfer, heat generation in electronics, temperature measurement, heat sink, Cooling of electronic devises: Active, Passive, and Hybrid Cooling. **Refrigeration:** Principle of refrigeration, Refrigeration effect, Ton of Refrigeration, COP, Refrigerants and their desirable properties. Principles and Operation of Vapor Compression and Vapor absorption refrigeration. Applications of Refrigerator. **Air-Conditioning:** Classification and Applications of Air Conditioners. Concept and operation of Centralized air conditioning system.
MODULE 5 Advanced Technologies — **10 Hrs**
Mechatronics: Introduction, Concept of open-loop and closed-loop systems, Examples of Mechatronic systems and their working principle. **Robotics:** Introduction, Robot anatomy, Joints & links, common Robot configurations. Applications of Robotics in Material Handling, Processing, Assembly, and Inspection. **Electric and Hybrid Vehicles:** Introduction, Components of Electric and Hybrid Vehicles, Drives and Transmission. Advantages and disadvantages of EVs and Hybrid vehicles.

List of Laboratory/Practical Experiments activities to be conduct
● Demonstration on Principle and Operation of any one Turbo machine ● Demonstration on pumps ● Visit any one Conventional or Renewable Energy Power Plant and prepare a comprehensive report. ● One exercises each involving Fitting and Sheet metal. One exercises each involving welding and Soldering. ● Study oxy-acetylene gas flame structure and its application to gas welding ● Demonstration on Principle and Operation of CNC machine. Demonstration on Principle and Operation of 3D printing process. ● Demonstration of anyone Heat transfer application device and prepare a comprehensive report. ● Demonstration of anyone air conditioning system. ● Demonstration of the machine consists of Gear Trains. ● Demonstration of various elements of mechatronic system. ● Demonstration of any one model of Robot

TEXT BOOKS:

1. Basic and Applied Thermodynamics, P.K.Nag, Tata McGraw Hill 2nd Ed., 2002
2. Non-Conventional Energy Sources, G.D Rai, Khanna Publishers, 2003
3. Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt. Ltd., 2010

4. Thermal Management in Electronic Equipment, HCL Technologies, 2010
5. Robotics, Appu Kuttan KK K. International Pvt Ltd, volume 1

REFERENCES:

1. An Introduction to Mechanical Engineering, Jonathan Wickert and Kemper Lewis, Third Edition, 2012
2. Turbo Machines, M. S. Govindegowda and A. M. Nagaraj, M. M. Publications 7Th Ed, 2012
3. Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rd Ed., 2003.
4. Thermal Management of Microelectronic Equipment, L. T. Yeh and R. C. Chu, ASME Press, New York, 2002
5. Fundamentals of Robotics: Analysis and Control, Robert J. Schilling, Pearson Education (US).

INTRODUCTION TO ELECTRICAL ENGINEERING

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – I/II

Subject Code	:		**Credits**	:	02
Hours / Week	:	02 Hours	**Total Hours**	:	26 Hours
L–T–P	:	2–0–0			

Course Learning Objectives:

This course enables students to:

- **Demonstrate** a foundational understanding of electrical quantities, including current, voltage, power, and energy.
- **Apply** fundamental laws of electric circuits, such as Ohm's law and Kirchhoff's laws to evaluate electrical circuits.
- **Explain** fundamental concepts of electro-magnetic circuits.
- **Demonstrate** a foundational understanding of the working principles, construction, and characteristics of DC machines.
- **Illustrate** the construction, operation, and types of transformers, considering their significance in electrical systems.
- **Explain** the structure and components of electrical power system, highlighting their interconnections.
- **Explain** emerging trends of green energy technologies and smart metering.
- **Explain** the importance of earthing, protective devices, and proper wiring for ensuring electrical safety.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT – I	**10 Hours**

Fundamentals laws of Electrical circuit and elements: Electrical charge, potential; current; power and energy; AC and DC current (mathematical treatment); Ohm's law; KCL and KVL in resistive circuits; series and parallel combination of resistors; voltage and current division rule; V-I relationships for inductor and

capacitor under AC voltage; impedance and admittance (series RC and RL); Overview of active power, reactive power and power factor; Introduction to 3 phase systems; Simulation using LTspice software to demonstrate voltage division, current division in resistive circuits. Simulation using LTspice software to show voltage and current waveform for RC and RL circuit.

(TextBook-1: Chapter 1: 1.1 to 1.4, 1.6 to 1.8. Chapter 2: 2.1 to 2.3. Chapter 4: 4.1 to 4.4 Chapter 6: 6.1 to 6.4)

UNIT – II	**10 Hours**

Electromagnetic circuits:
Magnetic circuits: Basics of magnetic circuits (flux, mmf, permeability, reluctance, B and H); Relation between field theory and circuit theory; Faraday's and lenz's laws, Lorentz force; Self and Mutual inductance.
DC machines: Principle of operation of DC generator; generated EMF equation; classification; characteristics and applications. (Introductory treatment only); Principle of operation of DC Motor; back EMF; speed and torque; classification; characteristics and applications. Losses and efficiency in DC machines.
Transformers: Construction, working principle, induced emf equation; step-up and step down; losses and efficiency.

(TextBook-2: Chapter 7: 7.1 to 7.12; Textbook 1: 10.1, 10.2, 10.4, 10.5, 10.8, 10.9, 10.11 and 10.12; Chapter 8: 8.1, 8.2 and 8.9)

UNIT – III	**06Hours**

Powers system fundamentals: Power system structure; generations sources; green energy; smart meters; power tariff calculations; Electrical safety and standards (IS: 732-2019, IEC: 60446): Colour code of wires for single phase supply, earthing, fuse and MCB.

(Textbook 1: , Chapter 16: 16.1 to 16.5; Textbook 2: Chapter 24: 24.1 to 24.6)

Course Outcome	**Description**	**Bloom's Taxonomy Level**
At the end of the course the student will be able to:		
CO1	**Solve** for voltage, current, power and energy in purely R, series RL and RC circuits under DC and AC voltages.	L3
CO2	**Demonstrate** understanding of principle of operation of DC machines and its applications.	L2
CO3	**Demonstrate** understanding of the working principle of transformers.	L2
CO4	**Demonstrate** understanding of the working principle of transformers, generation sources, the significance of renewable energy sources in electrical engineering, and safety practices.	L2

CO5	Demonstrate proficiency in using simulation software (e.g., LTspice) to simulate and **solve** electrical parametrs.	L3

Table: Mapping Levels of COs to POs / PSOs

COs	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2		1	3						1		1		
CO2	3	2									1		1		
CO3	3	2									1		1		
CO4	3					2	3	2			1		1	1	2
CO5	3	3	2	1	3				1	1	2	2	1	1	

TEXT BOOKS:

1. D.P.Kothari and I.J. Nagrath, "Basic Electrical Engineering", 4th Edition, Tata McGraw Hill, 2019.
2. B.L. Theraja and A.K. Therja, "A textbook of electrical technology, Vol. I (Basic electrical Engineering)", S. Chand Publishing, 23rd Rev Ed, 2006.

REFERENCE BOOKS:

1. Clayton Paul, Syed A Nasar and Louis Unnewehr, "Introduction to Electrical Engineering", 2nd Edition, McGraw-Hill, 1992.
2. William H Hayt and Jack E Kimberly and Steven M Durbin, "Engineering Circuit Analysis" 8th Edition, McGraw-Hill, 2013.

E-Resources:

1. https://nptel.ac.in/courses/108/108/108108076

Activity Based Learning (Suggested Activities in Class):

1. Real world problem solving using group discussion and hands-on activities. E.g., Interfacing different types of sensors using Arduino.
2. Simulation of different electrical circuits. E.g., RL and RC circuits.

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C PROGRAMMING FOR PROBLEM SOLVING

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – I

Subject Code	:	**Credits**	: 03
Hours / Week	: 02 Hours	**Total Hours**	: 26(T)+26 (P)Hours
L–T–P–S	: 2–2–2–0		

Course Learning Objectives:

This Course will enable students to:

1. **Elucidate** the basic architecture and functionalities of C programming language.
2. **Apply** programming constructs of C language to solve the complex problems
3. **Explore** data structures like arrays, structures, unions and pointers in implementing solutions to real world problems
4. **Design** and Develop Solutions to problems using structured programming constructs such as functions.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different type of teaching methods may be adopted to develop the course outcomes. 2. ***Interactive Teaching:*** Adopt the Active learning that includes brainstorming,
discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.

8. Discuss how every ***concept can be applied to the real world*** - and when that possible, it helps improve the students' understanding.	
UNIT – I	**07 Hours**
Basics and overview of C: Introduction to Problem Solving using Algorithms and Flowchart: Key features of Algorithms: Sequence, Decision, Repetition with examples. Background, structure of C program, keywords, Identifiers, Data Types, Variables, Constants, Input / Output statements, Operators (Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associativity, Expression Evaluation, Type conversions. Conditional Branching Statements-if and switch statements, iterative statements (loops)-while, for, do-while statements, Loop examples, Nested loops, break, continue, go to statement. ***(Text Book-1: Chapter 2 & Chapter 3)***	
UNIT – II	**05 Hours**
Arrays: Introduction, declaration & initialization of array, reading and writing array elements, Operations on array: Traversal, searching (Linear and Binary search), sorting (Bubble sort and Selection Sort). Declaration and Initialization of two-dimensional arrays. Matrix Operations (addition, subtraction, multiplication, transpose) using two-dimensional array. **Strings:** Definition, declaration, initialization, and representation. String handling functions and character handling functions. ***(Text Book-1: Chapter 5:5.1 to 5.9 & Chapter 6)***	
UNIT – III	**06 Hours**
Pointers: Definition and declaration and initialization of pointers. Accessing values using pointers. Accessing array elements using pointers. **Functions:** Definition and declaration. Built-in functions and User-defined functions. Categories of functions with example. Pointers as function arguments, array as function argument, Call-by-value and call-by-reference. Recursion. ***(Text Book-1: Chapter 7: 7.1 to 7.17 & Chapter 4:4.1 to 4.8, 4.10)***	
UNIT – IV	**04 Hours**
Structures: Purpose and usage of structures. Declaration of structures. Assignment with structures. Structure variables and arrays. Nested structures. Student and employee database implementation using structures. **Unions**: Declaration and initialization of a union. Difference between structures and unions. Example programs. ***(Text Book-1: Chapter 8: 8.1, 8.2,8.6)***	
UNIT – V	**04 Hours**
Memory allocation in C programs: Dynamic memory allocation, memory allocation process, allocating a block of memory, releasing the used space, altering the size of allocated memory. **Files**: Defining, open, read, write, seek and closing of both textual and random files. ***(Text Book-1: Chapter 7: 7.18 to 7.20 & Chapter 9: 9.1 to 9.5, 9.8)***	

Course Outcome	Description	Bloom's Taxonomy Level
At the end of the course the student will be able to:		
1	**Apply** programming constructs of C language to solve the real-world problem.	L3
2	**Choose** appropriate data type for implementing solutions to solve problems like searching and sorting.	L3
3	**Examine** suitable user-defined data structures in implementing solutions, using modular programming constructs.	L4
4	**Analyze** efficient ways for managing data and storage.	L4
5	**Justify** a solution using a modern IDE and associated tools, conduct a code review and contribute in a small-team.	L5

Table: Mapping Levels of COs to POs / PSOs

COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2		2												
CO3			2										1	
CO4				2										
CO5					3				2				1	

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXT BOOKS:

1. Reema Thareja, "Programming in C". Oxford University Press, Second Edition, 2016.

REFERENCE BOOKS:

1. Brian W. Kernigham and Dennis M. Ritchie, (2012) "The C Programming Language", 2nd Edition, PHI.
2. Behrouz A. Forouzan, Richard F. Gilberg, "Computer Science - A Structured Approach Using C", Cengage Learning, 2007.
3. Vikas Gupta, "Computer Concepts and C Programming", Dreamtech Press 2013.

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105171/ MOOC courses can be adopted for more clarity in understanding the topics and verities of problem-solving methods.
2. https://www.w3schools.com/c/index.php

3. https://www.guvi.in/courses/web-development/c-programming/
4. https://www.tutorialspoint.com/cprogramming/index.htm
5. https://pythontutor.com/

Activity Based Learning (Suggested Activities in Class)

- Demonstration of solution to a problem through designing the Flowchart or any design notations using **draw.io** in the group of four and justify using snippets or algorithms.

C PROGRAMMING FOR PROBLEM SOLVING LABORATORY

Total Contact Hours: 26

List of Laboratory/Practical Experiments activities to be conducted

1. a. Design a C program to Swapping of two numbers. (Simple Expressions).

   b. Design a C program to find the simple interest as per the below conditions (Simple expressions, Integer division issues (data loss), Explicit typecasting, when p, t, r are integers and si is float.

2. Design a program that takes three coefficients (a, b, and c) of a Quadratic equation ($ax^2+bx+c=0$) as input and compute all possible roots.

3. a Write a program to calculate the factorial of a given number.

   b Write a program to check if the given number is palindrome.

4. a Sum of natural numbers (sum(n) = n + sum(n-1);).

   b. Write a program to calculate Power of a number ($b^n = b * b^{n-1}$).

5. a. Write a program to calculate n numbers of Fibonacci series.

   b. Write a program to calculate GCD of two numbers.

6. Write a program to emulate a calculator with the following operations: Addition, Subtraction, Multiplication, Division – using functions, switch and break.)

7. Write a program to add two matrices and transpose the resultant matrix.

8. Write a user defined function to:
   - reverse.
   - concatenate the two strings.
   - find the length of the strings.

9. Write a program using Bubble sort technique to sort an array of integer elements (Sorting technique, Const array arguments.)

10. Write a program to search an array of elements of data type requested by the user for a given item using binary search algorithm. (Searching technique, Const array arguments).

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ENGINEERING MECHANICS

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – I/II

Subject Code	:	**Credits**	: 02
Hours / Week	: 02 Hours	**Total Hours**	: 26 Hours
L–T–P–S	: 2–0–0–0		

Course Learning Objectives:

This Course will enable students to:

1. **Illustrate** Couples and equivalent force couple system
2. **Understand the** principles of resolution and composition of forces
3. **Calculate** moment of coplanar concurrent and coplanar non-concurrent forces
4. **Draw** free body diagrams of objects subjected to coplanar concurrent and non-concurrent force systems
5. **Calculate** center of gravity/centroid for various planar figures

6. **Determine** area moment of inertia for various planar geometrical objects and standard symmetrical sections
7. **Explain** Limiting friction and Laws of Friction
8. **Solve numerical on** wedge friction, ladder friction
9. **Explain** assumptions made in analysis of Trusses
10. **Determine** axial forces in members of Planar determinate Truss
11. **Illustrate** rectilinear, plane curvilinear and projectile motions

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT – I Introduction to Engineering Mechanics	**06 Hours**

INTRODUCTION:

Introduction to Engineering Mechanics, Force Systems Basic concepts, Particle Equilibrium in 2-D; System of Forces, Co-planar Concurrent Forces, Resultant- Moment of Forces and its Application; Couples and Resultant of force System, Equilibrium of System of Forces,

UNIT – II Centroid, Centre and gravity and Moment of inertia	**05 Hours**

Introduction, Centroid of simple figures from first principle, centroid of standar sections Centre of Gravity and its implications; Area moment of inertia Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections

UNIT – III Friction	**05 Hours**

Introduction, Free body diagrams, Equations of Equilibrium. Types of friction, Limiting friction, Cone of Friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, related problems.

UNIT – IV Dynamics	**05 Hours**

Introduction, Rectilinear motion; Plane curvilinear motion (rectangular path, and polar coordinates); Projectile motion, Basic terms, general principles in dynamics; Types of motion, motion and simple problems, Kinetics- Newton's laws of motion and related problems.

UNIT – V Analysis of Trusses	**05 Hours**

Introduction, Classification of trusses, Equilibrium in two and three dimension; Method of Joints; To determine if a member is in tension or compression; Simple Trusses; Zero force members.

Course Outcomes:

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

1. **Compute** Resultant and reactions by principles and resolution of forces in a plane.
2. **Analyse** the objects under the action of applied and frictional forces in a plane by equations of equilibrium.
3. **Determine** the Moment of Inertia of composite geometrical sections in a plane
4. **Analyse** determinate two-dimensional truss by the method of joints and method of section.
5. **Analyze** the motion of objects by equations of motion, equations of equilibrium, and Newton's laws of motion and **calculate** quantities in projectile motion by equations of motion.

Table: Mapping Levels of COs to POs / PSOs

COs	**Program Outcomes (POs)**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO 1	3	3	2	2	0	0	1	1	0	0	0	0	1	3	2
CO 2	2	2	2	2	0	0	1	0	0	0	0	0	2	2	0
CO 3	3	3	2	2	0	0	1	0	1	0	0	0	3	2	0
CO 4	3	3	2	2	0	0	1	0	0	0	0	0	3	3	0
CO 5	3	2	2	2	0	0	1	0	0	0	0	0	2	2	0

3: Substantial (High) 2: Moderate (Medium) 1: Poor (Low)

TEXT BOOKS:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall publications.
2. A Nelson (2009), Engineering Mechanics: Statics and dynamics, Tata McGraw Hill publications.

REFERENCE BOOKS:

1. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill publications.
2. R.C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
3. H.J. Sawant, S.P Nitsure (2018), Elements of Civil Engineering and Engineering Mechanics, Technical Publications.

E-Resources:

1. https://archive.nptel.ac.in/courses/105/105/105105108/
2. https://onlinecourses.nptel.ac.in/noc22_ce46/preview
3. https://www.youtube.com/watch?v=LIZ-PQbGZkA

Activity Based Learning (Suggested Activities in Class)

1. Real world problem solving and puzzles using group discussion.
2. Demonstration of solution to a problem through experiential learning.
3. Demonstrations using real objects, taking students on an educational tour.

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TECHNICAL ENGLISH

[As per Choice Based Credit System (CBCS) scheme]

SEMESTERS – I & II

Subject Code	:	22EN1114	**Credits**	:	02
Hours / Week	:	02 Hours	**Total Hours**	:	26 Hours
L–T–P-J	:	01-02- 00-00			

Objective:

Developing Communicative competence: Enhancing the Language competence in the technical discourse and augmenting the strategic competence in the social and professional environment.

Course Learning Objectives:

This course will enable students to:

a. To enable students to improve their lexical and grammatical competence.
b. To enhance their verbal and nonverbal communication in a professional environment
c. To optimize oral and written communication.
d. To familiarize the students with employability and job search skills.

e. To enhance the students with soft skills

f. To inculcate critical thinking

Teaching-Learning Process (General Instructions)

These are some of the innovative pedagogical approaches to accelerate the attainment of the various course outcomes.

1. ***Lecture method***: Anecdotes, case studies and Examples from real-life situations may be adopted along with the traditional method of chalk and talk to achieve the course outcome.
2. ***Interactive Teaching: Active learning*** may be adopted which includes brainstorming, Teamwork, focused listening, formulating questions, note-taking, and Role play.
3. ***Collaborative*** learning through Debates and Group Discussion
4. ***Activity-based learning*** to inculcate Critical ***thinking*** – conceptualizing, applying, analyzing, synthesizing, and/or evaluating information from observation, perception, and expression. Minimum three higher-order questions from the real-world context
5. ***Problem-Solving method through*** Activities and discussion / Minimum of three situations to inculcate ***Problem-Solving skills*** and encourage the students to come up with creative ways to solve the problem
6. ***Audio-visual methods*** through language Lab in the teaching of LSRW skills.

7. ***Short films/ Ted talks/ Videos/Animation*** films to explain the functioning of various concepts.
8. ***Flipped learning***
9. ***Peer learning / Peer tutoring***

Module – I	**06 Hours**

Grammar and Usage, Language and Communication*.*

(Branches of Grammar and Vocabulary Word Formation and Types of Word Formation. Communication process diagram. Types of Communication: Managerial, Corporate, Technical and Other Organizational Communication. Barriers to Effective Communication. Listening: Types and their Importance. Difference between hearing and listening. Speaking: Different aspects of Effective Speaking. Oral presentation Pronunciation Guidelines- Common Errors of Pronunciation- Various Techniques for Neutralization of Mother Tongue Influence)

Objective:

- Revising and practicing grammar will help students to optimize their language Competence
- Listening steps up language learning and improves pronunciation
- Speaking improves one's ability to construct phrases naturally and spontaneously in everyday discussions, Clarity and comprehensiveness in speech.
- Communicating effectively in the Professional environment, to interact with the colleagues and to involve in collaborate initiatives

Module – II	**06 Hours**

Reading: Extensive and Intensive. ***Technical Paper Writing and Minutes of the Meeting****.*

Objective:

- Reading provides exposure to the chosen field and helps in the coherence of the thought process
- Technical writing techniques enable the knowledge in the relevant domain and creates better content based on the need of the target group
- Meeting minutes allows to access information such as facts, opinions, votes cast, conflicts, attendees, and other crucial elements at the workplace.

Module – III	**05 Hours**

Memo and E-mail Etiquette. Referencing Skills for Academic Report Writing.

Objective:

- Familiarizing with email etiquettes and correspondence provides learners to form an excellent first impression, establishing trust and confidence.
- Following the Academic conventions helps the students to optimize their reference skills and use references to acknowledge the input of other authors and scholars in their work and avoid plagiarism.
- Writing technical reports develop competence in creating a legally bound account of efforts and choices and engineering technical report propose a solution to a problem in order to inspire action.

Module – IV	**04 Hours**

Group Discussion: Definition, How GD Helps in Student Life & Corporate Life.

Objective: GD helps individuals to achieve the skills of organizing and presenting the ideas and concepts in a cohesive manner and to overcome the inhibition of expression in communication

Module – V	**05 Hours**

Drafting Curriculum Vitae, Resumes, and Cover- Letters. Job Applications.

{Types of Resumes, Preparing Resume, CV and Cover- Letter. Filling Job Application. Difference between Curriculum Vitae, Interview techniques: Telephonic interviews, Group interviews, face-to-face interviews -Mannerism and etiquette}.

Objective: Learning the specifics of creating a CV or Resume helps in the effective presentation of their achievements and skills, and a cover letter is a chance for them to exhibit a few aspects of their personality.

Course Outcome	**Description**	**Bloom's Taxonomy Level**
At the end of the course, the student will be able to:		
1	Developing language competence **improves** one's ability to construct phrases naturally in everyday discussions and	L3

	Communication skills and soft skills enhance the self-confidence of students,	
2	**Applying** the fundamentals of technical writing techniques provides adequate exposure to the respective domain and creates better content. **Implementing** the technicalities of writing provides better exposure in the domain.	L3
3	**Following** an appropriate style of email reveals the aspect of professionalism. **Develop** technical writing skills to increase the quality of the work and testimony of conduct.	L3
4	**Practicing** communication with greater clarity and ease enable the students to discuss a wide spectrum of topics.	L3
5	Writing resumes or curriculum vitae provides a practice to exhibit their skills and achievements concisely and writing a covering letter enables them to express their personality in the formal context.	L3

Table: Mapping Levels of COs to POs / PSOs

COs	**Program Outcomes (POs)**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1										2				
CO2										2				
CO3										2				
CO4										2				
CO5										2				

TEXT BOOKS:

1. Dhanavel, S.P. "English and Communication Skills for Students of Science and Engineering". Orient Blackswan Pvt. Ltd., 2009. Print.

2. Meenakshi Raman and Sangeetha Sharma. “Technical Communication- Principles and Practice”. 3rd Edition, Oxford University Press, 2009. Print.

3. Murphy R. “English Grammar in Use”, Cambridge University Press,2012. Print.

4. N. Krishnaswamy and T. Sri Raman. “Creative English for communication”, Macmillan Publication, 2005. Print.

REFERENCE BOOKS:

1. Day. R A. “Scientific English: A Guide for Scientists and Other Professional”. 2nd Edition, Hyderabad: Universities Press, 2000. Print.

2. Ashraf Rizvi M. “Effective Technical Communication”. McGraw Hill Education, 2017. Print.

3. Eastwood J. “Oxford Practice Grammar”. Oxford University Press, 1999. Print.

4. Swan M and Walter C. “Oxford English Grammar Course”. Oxford University Press, 2011. Print.

5. Dale, Carnegie. “The Quick and Easy Way to Effective Speaking”. JAICO Publishing House, 2019. Print.

6. Chauhan, Gajendra S and Smita, Kashiramka. “Technical Communication”. India: Cengage Learning India Private Limited, 2018. Print.

7. Bailey, Stephen. “Academic Writing: A Handbook for International Students”. 5th Edition, Routledge, 2017. Print.

8. Kumar, Shiv K and Nagarajan, Hemalatha. “Learn Correct English: Grammar, Composition and Usage”**.** 1st edition, India: Pearson, 2005. Print.

9. Board of Editors. Language and Life: A Skills Approach. Orient BlackSwan, 2018.

10. Sudharshana, NP and C Savitha. English for Engineers. Cambridge University Press, 2018.

11. Kumar, Sanjay and Pushp Lata. English Language and Communication Skills for Engineers. Oxford University Press, 2018.

12. Thomson, A.J. and Martinet, A.V. A Practical English Grammar, OUP, New Delhi: 1986

13. Anne Laws, —Writing Skills||, Orient Black Swan, Hyderabad, 2011

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

E-Resources:

1.https://gnindia.dronacharya.info/ME/Common-Subjects/Downloads/Technical-Communication/Books/Technical-Communication-Book-9.pdf. Web.

2. https://projects.iq.harvard.edu/files/hks-communications-program/files/ho_murphy_michael-pp-slides_9_30_14.pdf. Web.

3. https://www.youtube.com/watch?v=TR0JZiapxXM. Web.

4.file:///C:/Users/rochn/Downloads/ManualofEnglishGrammarandComposition_10012575.pdf. Web.

5. https://www.youtube.com/watch?v=f5Tao6KHV5w. Web.

6.https://www.sastra.edu/nptel/download/Prof%20GPRagini/pdf_New/Unit%2026.pdf. Web.

7.https://www.hansrajcollege.ac.in/hCPanel/uploads/elearning/elearning_document/English_communication_chapter_13.pdf. Web.

8. https://www.youtube.com/watch?v=voyGGhlpBR8. Web.

Activity Based Learning (Suggested Activities in Class)

1. Observing and responding appropriately to the real-life situations.
2. Encouraging students to participate in Group discussions.
3. Articulating internal observations precisely and confidently through extempore.
4. Producing sentences easily without any grammatical errors in speaking, writing essays, and creative writing.
5. Conducting mock interviews, to refine their expressions, familiarize them with the interview techniques, and provide training for the spontaneous response to tricky questions.
6. Directing students for PowerPoint presentations and orienting them towards the higher order skills of expressing their ideas and concepts with cohesion.

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ENVIRONMENTAL SCIENCES

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – I/II

Subject Code	:	**Credits**	: 01
Hours / Week	: 01 Hour	**Total Hours**	: 13 Hours
L–T–P–S	: 1–0–0–0		

Course Learning Objectives:

This Course will enable students to:

1. Understand the concepts of environment, pollution, energy resources Understand basic engineering principles imminently run physiological processes particularly about engineering designs and solutions are arrived citing body functional examples.
2. Learn water as a resource, rain water harvesting as a method of conversation of water.
3. Explain solid waste and its management.
4. Understand environmental Protection Act laws, environmental Impact Analysis and air monitoring

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* like power point presentations and group discussion may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.

3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three higher order thinking questions in the class.
6. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

COURSE CONTENT:	
UNIT 1: Environment and ecosystem	**3 Hrs**
Definition of environment; Scope and importance of environmental studies; Basic concepts: Xenobiotic, natural & anthropogenic; why are we concerned? Eco-kinetic & Bio-kinetic Properties of a xenobiotic, Dose-Response Relationships;3 T's, Chronic and acute effects.	
UNIT 2 : Pollution and management	**4 Hrs**
Air Pollution: Criteria pollutants – Ozone, Particulate Matter, Carbon Monoxide, Nitrogen, Oxides, Sulphur Dioxide, Lead; Acid Rain Cycle. Water as a resource; Lentic and Lotic Water Systems; Rain Water Harvesting; Water Pollution; Noise pollution-sources and effects of noise; Municipal Solid Waste: Hazardous Waste: Electronic Waste: Biomedical Waste; Solid Waste Management: Landfills, composting Process.	
UNIT 3: Energy	**2 Hrs**
Energy Types of energy: Conventional sources of energy, fossil fuel, Coal, Solar, wind; Non-conventional Sources of Energy, Biofuels - biomass, biogas.	
UNIT 4: Disaster	**2 Hrs**
Disasters & Management; Definition, Natural (Earthquakes, landslides, floods), Man-made disasters (biological, chemical, nuclear, radiological explosions) – definition, causes and management and/or mitigation strategies; Bhopal & Chernobyl Disasters.	
UNIT 5: Environmental acts	**2 Hrs**
Environmental Impact Assessment (EIA); Air pollution monitoring and Ambient Air Quality Standards (AAQS); Environment Protection Act, 1986.	

Course Outcome	**Description**	**Bloom's Taxonomy Level**
At the end of the course the student will be able to:		
1	**Critically elucidate** the basic concepts that govern environmental quality, ambient air quality standards.	L3
2.	**Distinguish** different Energy resources and their environmental implications	
3.	**Distinguish** natural and manmade disasters and prevention	L3
4.	**Demonstrate** different types of pollution and waste streams	L3

5.	**Apply** the process of environmental impact assessment and implications of Indian Environment Laws	

Activity Based Learning (Suggested Activities in Class)

1. Real world problem solving and puzzles using group discussion.
2. Demonstration of solution to a problem through experiential learning.
3. Demonstrations using real objects, taking students on an educational tour.

TEXT BOOKS:

1. Benny Joseph (2005). "Environmental Studies", Tata McGraw – Hill Publishing Company Limited, New Delhi.
2. R. J. Ranjit Daniels and Jagadish Krishnaswamy (2014). "Environmental Studies" (2014), Wiley India Pvt Limited, New Delhi.

REFERENCE BOOKS:

1. P. Aarne Vesilind, Susan M.Morgan, Thomson (2008). "Introduction to Environmental Engineering" (2008), Thomson learning, Second Edition, Boston.
2. R. Rajagopalan (2005). "Environmental Studies – From Crisis to Cure" Oxford University Press, New Delhi.

KANNADA KALI

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – I/II

Subject Code	:	**Credits**	:	01
Hours / Week	: 01 Hours	**Total Hours**	:	13 Hours
L–T–P-J	: 1–0–0-0			

Course Learning Objectives:

This course enables students:

- To introduce Kannada language & culture to Non – Kannada speakers.
- To train them to communicate in colloquial Kannada with connivance.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening.
3. Show ***Video/animation*** films to explain functioning of various concepts.

4. Encourage ***Collaborative*** (Group Learning) Learning in the class.	
UNIT – I	**08 Hours**
Introduction to Karnataka & Kannada Culture, Evolution of Kannada. Introduction to Kannada Alphabets. Introduction to Kannada Numbers.	
UNIT – II	**08 Hours**
Kannada words, sentences & phrase making for colloquial communication.	

Course Outcome	**Description**	**Bloom's Taxonomy Level**
At the end of the course the student will be able to:		
1	The learners can communicate in Kannada & acquaint themselves with Kannada culture.	L2 & L3

Table: Mapping Levels of COs to POs / PSOs

COs	**Program Outcomes (POs)**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	1													

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXT BOOKS:

1. Kannada Kali –Dr. Lingadevaru Halemane
2. Kannada Paatagalu– Editor: Dr. Chandrashekara Kambara.
3. SLN Sharma & K Shankaranarayana "Basic Grammar", Navakarnataka Publications.
4. Spoken Kannada. Publication: Kannada Sahitya Parishat Bengaluru.

SINGLE AND MULTI VARIABLE CALCULUS

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – II

Subject Code	:	22EN1201	**Credits**	:	03
Hours / Week	:	03 Hours	**Total Hours**	:	39 Hours
L–T–P–J	:	3–0–0-0			

Course Learning Objectives:

This Course will enable students to:

1. **Apply** sophisticated techniques of differential calculus to solve problems involving functions of multiple variables.
2. **Apply** double and triple integrals in various coordinate systems (Cartesian, polar, cylindrical, and spherical) and effectively employ them to calculate areas, volumes.

3. **Acquire** a comprehensive understanding of fundamental concepts related to functions of multiple variables, including limits, continuity, and partial derivatives.
4. **Analyze** critical points of functions of two or more variables using partial derivatives and Lagrange multipliers, evaluate extreme values.
5. **Apply** vector calculus principles, such as line integrals, surface integrals, and the divergence theorem effectively to vector field.
6. **Analyze** the convergence and divergence of sequences and infinite series of real numbers by employing various convergence criteria and tests.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT – I	**09 Hours**

Differential Calculus

Functions of two or more variables: Definition, Region in a plane, Level curves, Level surfaces, Limits, Continuity, Partial derivatives, Differentiability, Extreme values and saddle points, Lagrange multipliers. (***Textbook 1: Chapter 14: 14.1 – 14.4, 14.7, 14.8***)

Self-Learning Component: Single variable calculus

UNIT – II	**09 Hours**

Integral calculus

Double integral and iterated integrals - Cartesian and polar coordinates, Triple integral, Change of variables, Multiple integrals in cylindrical and spherical coordinates. (***Textbook 1: Chapter 15: 15.1 – 15.5, 15.7***)

UNIT – III	**09 Hours**

Vector Calculus

Line Integrals, Vector Fields, Work, Circulation and flux, Path independence, Potential functions, and Conservative fields, Green's theorem in the plane, Surface area and surface integrals, Surface area of solid of revolution, Parametrized surfaces, Stokes' theorem, The Divergence theorem. (***Textbook 1: Chapter 16: 16.1-16.8***), (***Textbook 2: Chapter 10: 10.1, 10.2, 10.4 – 10.7, 10.9***)

UNIT – IV	**6 Hours**

Sequence and Series I:

Sequences of real numbers and their convergence criteria, Infinite series, Sequence of partial sums, Tests for convergence/divergence - nth term test, Boundedness and monotonicity, Integral, Condensation, Comparison, Ratio and root tests (***Textbook 1: Chapter 10: 10.1-10.5***)

UNIT – V	**06 Hours**

Sequence And Series II:

Alternating series, Absolute and conditional convergence, Rearrangement theorem, Power series, Taylor and Maclaurin series (one and two variables). (***Textbook 1: Chapter 10: 10.6-10.8***)

Course Outcomes:

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

1. **Apply** the principles of differential calculus to solve problems involving functions of two or more variables.
2. **Utilize** double and triple integrals in Cartesian, polar, cylindrical, and spherical coordinates to compute areas, volumes, and evaluate mathematical expressions**.**
3. **Extend** a comprehensive understanding of the concepts related to functions of multiple variables, encompassing topics such as limits, continuity, and partial derivatives, and effectively apply them to practical situations and problem-solving scenarios.
4. **Analyze** and evaluate critical points, including extreme values and saddle points, in functions of two or more variables using partial derivatives and Lagrange multipliers.
5. **Analyze** vector calculus concepts, such as line integrals, surface integrals, and the divergence theorem, in the context of vector fields and their applications.
6. **Apply** convergence criteria and various tests, such as the nth term test, boundedness and monotonicity, integral, condensation, comparison, ratio, and root tests, to analyze and determine the convergence or divergence of sequences and infinite series of real numbers.

Table: Mapping Levels of COs to POs / PSOs

COs	**Program Outcomes (POs)**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	1						1					
CO2	3	2	1						1					
CO3	3	2	1						1					

CO4	3	2	1						1					
CO5	3	2	1						1					
CO6	3	2	1						1					

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXT BOOKS:

1. Thomas' Calculus, George B. Thomas, D. Weir and J. Hass, 2014, 13th edition, Pearson.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 2015, 10th Edition, Wiley India.

REFERENCE BOOKS:

1. Higher Engineering Mathematics, B.S. Grewal, 2015, 43rd Edition, Khanna Publishers.
2. Higher Engineering Mathematics, John Bird, 2017, 6 th Edition, Elsevier Limited.
3. Calculus: Early Transcendentals, James Stewart, 2017, 8 th edition, Cengage Learning.
4. Engineering Mathematics, K.A. Stroud and Dexter J. Booth, 2013, 7 th Edition, Palgrave Macmillan.
5. Basic Multi Variable Calculus, Marsden, Tromba and Weinstein, W.H. Freeman, Third Edition

E-Resources:

1. **https://www.youtube.com/playlist?list=PLtKWB-wrvn4nA2h8TFxzWL2zy8O9th_fy**
2. **https://www.youtube.com/playlist?list=PLU6SqdYcYsfJqbZvQECrwnlQrp4fg6isX**

Activity Based Learning (Suggested Activities in Class)

1. Real world problem solving and puzzles using group discussion.
2. Demonstration of solution to a problem through programming.

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ENGINEERING PHYSICS
[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – I & II					
Subject Code	:	22EN1109	**Credits**	:	04
Hours / Week	:	03 Hours	**Total Hours**	:	39 + 26 Hours
L–T–P-J	:	3–0–2-0			

Course Learning Objectives:

This Course will enable students to:

1. To introduce the fundamental ideas of quantum mechanics that are necessary for understanding and addressing engineering challenges.
2. To comprehend solids' band structure, semiconductors' electrical conductivity, and semiconductor devices such as LEDs, photodiodes, and solar cells, as well as their applications.
3. To examine many types of engineering materials, including electronic, electrical, mechanical, and magnetic materials, as well as dielectric material properties and applications in science and engineering.
4. To comprehend various crystal systems and determine structure using miller-indices.
5. Describe thin-film phenomena, thin-film production processes, and applications in science and engineering.
6. To understand how to create Nano materials utilizing a top-down and bottom-up method, as well as to explore Nano science and technology, as well as its practical applications in engineering, biology, and medicine.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

SYLLABUS	
MODULE – I	**08 Hours**

QUANTUM MECHANICS:

- Foundations of quantum theory, Wave function and its properties, de-Broglie hypothesis, Heisenberg Uncertainty principle. One dimensional time independent Schrodinger wave equation, Eigen values and Eigen functions. Applications: one dimensional motion of an electron in a potential-well. Basics of Quantum computing - Concepts of Superposition, entanglement, Interference and Qubit. [5 hours]

(Text book 1: Chapter 1.5 and Chapter 2 all units)

- **LASER PHYSICS:** Introduction to lasers. Conditions for laser action. Requisites of a Laser system Principle, Construction and working of Nd-YAG and Semiconductor Laser. Application of Lasers in Defense (Laser range finder), Engineering (Data storage) and Applications of Lasers in medicine [3 hours]

(Text book 1: Chapter 5.1, 5.2, 5.3, 5.4, 5.5)

MODULE – II	08 Hours

- **Semiconductor Physics**: Band structure, Fermi level in intrinsic and extrinsic semiconductors, Density of energy states in conduction and valence bands of a semiconductor (Mention the expression), Expression for concentration of electrons in conduction band (Derivation), Hole concentration in valance band (Mention the expression), Intrinsic carrier concentration, Conductivity of semiconductors, Hall effect, Numericals. (5 hours)

(Text Book-2: Chapter 24.1 to 24.9, Chapter 25.9 to 25.11)

- **Semiconducting devices for optoelectronics applications**: - Principle and working of LED, photodiode, Solar cell, BJT [3 hours]

(Text Book-2: Chapter 25.1 to 25.8)

MODULE – III	08 Hours

- **Dielectrics:** Introduction – Dielectric polarization **–** Dielectric Polarizability, Susceptibility and Dielectric constant - Types of polarizations: Electronic, Ionic and Orientation polarizations (qualitative) – Lorentz Internal field (Expression only) – Claussius - Mossoti equation (derivation) – Applications of Dielectrics – Numericals. (4 hours)

(Text book 1: Chapter 4.1, 4.2, 4.3, 4.4, 4.5)

- **Magnetic Materials:** Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Classification of magnetic materials: Dia, para, Ferro,

antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials - Engineering applications. Numiricals (4 hours)

(Text book 1: Chapter 4.9, 4.10, 4.11)

MODULE – IV	08 Hours

- **Crystallography:** Lattice, unit cell, lattice parameters, crystal systems, Bravais lattices, Packing fraction for SCC, BCC and FCC crystal systems. Introduction to Miller Indices. Determination of Crystal structure by Miller Indices. Expression for Inter-planar distance. X-ray diffraction, Bragg's law and Determination of Crystal structure by Powder method. Numericals [4 hours]

(Text book 1: Chapter 7 all units)

- **Mechanical Engineering Materials** – mechanical properties: stress- strain curve for different materials. Introduction to Tensile strength, Compressive strength, Ductility, Toughness, Brittleness, Impact strength, Fatigue, Creep. Testing of engineering materials: Hardness Tests: Brinell and Vickers hardness test& Numiricals- (4 hours)

(Text Book-2: Chapter 2.1 to 2.7)

MODULE – V	07 Hours

- **Thin films technology:** Introduction to thin-films-Advantages of thin-films over bulk materials. Thin film deposition processes- Physical vapour deposition (Thermal evaporation technique, and sputtering technique) process, Applications of Thin films. [3 hours]

(Ref. Text Book-2: Chapter 2. All units)

- **Nano Science &technology**: Introduction to Nano materials, Classification of nano materials, Size dependent properties of materials, Top-down and Bottom-up approach-Ball-milling and Photolithography, Process. Fundamental Principles of Biophysics & Applications of Nano technology in Biology and Engineering. [4 hours]

(Text Book-1: Chapter 8.1 to 8.7)

Course Outcome	Description	Bloom's Taxonomy Level
At the end of the course the student will be able to:		
1	Describe the concepts of Quantum mechanics and applications of Schrodinger time independent wave equation in one dimension.	L1 & L3
2	Illustrate Semiconductors, Semiconductor devices like Photo diode, LED, Solar cell and its applications.	L2 & L3
3	Distinguish the different engineering materials such as Electronic, electrical and mechanical materials properties and their applications in engineering.Apply the concept of magnetism to magnetic data storage devices.	L2 & L3
4	Classify Lattice parameters of different crystalline solids by using X-ray diffraction methods and its applications in science and engineering	L1 & L3
5	Interpret Basic concepts of thin films and thin film deposition processes and their applications leads to Sensors and engineering devices.	L2
6	Categorize Nano materials, Properties, and fabrication of Nano materials by using Top-down and Bottom –up approach's - Applications for Science and technology.	L2 & L3

Table: Mapping Levels of COs to POs / PSOs

COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2													1
CO2	2													1
CO3	2													1
CO4	1													1
CO5	1											1		2
CO6	3											2		3

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXT BOOKS:

1. P. S. Aithal, H. J. Ravindra, Textbook of Engineering Physics (2011), Acme learning Private Limited, New Delhi, India.
2. Shatendra Sharma, Jyotsna Sharma, Engineering Physics (2019), Pearson, Noida, Uttar Pradesh, India.

REFERENCE BOOKS:

1. M. Young (1977), Optics & Lasers An Engineering Physics approach, Springer
2 K.L. Chopra, Thin film Phenomena, McGraw Hill, New York.
3 S. O. Pillai (2018), Solid State Physics, revised edition, New Age International Publishers, New Delhi
4 M N Avadhanulu, P G Kshirsagar, TVS Arun Murthy (2018), A textbook of Engineering Physics, S Chand, New Delhi.

E-Resources:

1. https://nptel.ac.in/courses/106/101/106101060/
2. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms

Activity Based Learning (Suggested Activities in Class)

1. Demonstration of solution to a problem through Project demo model.

ENGINEERING PHYSICS LAB

Total Contact Hours: 26

Following are experiments to be carried out in Engineering Physics Lab

LABORATORY EXPERIMENTS:

List of Experiments:

1. I-V characteristics of a Zener Diode

I–V Characteristics of a Zener diode in forward and reverse bias condition (Module 2)

2. Planck's constant

Measurement of Planck's constant using LED (Module 2)

3.**Transistor characteristics**

Input and output characteristics of a NPN transistor in C-E configuration (Module2)

4. Dielectric constant

Determination of dielectric constant of a dielectric material (Module 2)

5. Torsional Pendulum

Determination of moment of inertia of a circular disc using torsional pendulum

6. Diffraction grating

Determination of wavelength of a laser light using diffraction grating (Module 4)

7. LCR series and parallel resonance

Study the frequency response of a series and parallel LCR circuit (Module 3)

8. Band gap energy

Determination of energy gap of an intrinsic semiconductor (Module 2)

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INTRODUCTION TO ELECTRONICS ENGINEERING

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – I/II

Subject Code	:		**Credits**	:	03
Hours / Week	:	03 Hours	**Total Hours**	:	39 Hours
L–T–P	:	3–0–0			

Course Learning Objectives:

This course enables students to

1. **Understand** the fundamental principles of diodes and their applications, including the band diagram of insulators, conductors, and semiconductors, diode construction, and V-I characteristics.
2. **Analyze** diode circuits under different biasing conditions and comprehend the behavior of diodes in applications such as AND gates, OR gates, rectifiers, and voltage regulators and simulate the same circuits using LTspice software.
3. **Comprehend** the construction, operation, and characteristics of bipolar junction transistors (BJTs), including input and output characteristics, different biasing techniques, and transistor amplification.
4. **Simulate** common emitter amplifier circuits with voltage divider bias using LTspice software.
5. **Demonstrate** an understanding of operational amplifiers (Op-amps), including their symbols, operation modes, properties, and applications such as amplifiers, comparators, and oscillators.
6. **Demonstrate** an understanding of digital electronics, including binary number systems, Boolean algebra, logic gates, sequential logic circuits, and the application of Flip-Flops.
7. **Simulate** digital circuits and components using LTspice software.
8. **Familiarize** themselves with microprocessors and microcontrollers, specifically Arduino boards, and understand their architecture and components.
9. Set up the Arduino development environment, write and upload code to the Arduino board, and **execute** simple Arduino programs.
10. Interface various sensors and engage in hands-on activities to reinforce understanding, including LED blinking and **designing** and **implementing** a complete Arduino-based system as a student project.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.

2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT – I	**09 Hours**

Diodes and its application: Band diagram of insulators, conductors and semiconductors; semiconductor types: intrinsic and extrinsic (n-type and p-type); overview of diode construction; diode under no-bias, forward bias and reverse bias; V-I characteristics of diode; simplified equivalent circuit of practical diode and ideal diode; overview of diode specifications: peak inverse voltage, reverse leakage current and maximum forward current; numerical on series diode configuration with DC input.
Applications: AND gate and OR gate using diodes, half wave rectifier and full-bridge full wave rectifier with smoothing capacitor; simulation of rectifier circuits with smoothing circuit using LTspice software; zener diode: zener region and voltage regulator; numerical on rectifier and voltage regulator.

(Textbook 1: Chapter 1: 1.1 to 1.7, 1.9, 1.12, 1.15, Chapter 2: 2.3, 2.5, 2.6, 2.7, 2.11)

UNIT – II	**08 Hours**

Transistors: Construction of npn and pnp BJT transistors; transistor operation; input and output characteristics of CB and CE configurations; significance of different regions of operation: active, cut-off and saturation (transistor as a switch); alpha, beta and current relations; transistor amplifying action; numerical on current relations and amplification; Need for biasing: Q-point; types of biasing: fixed, emitter stabilized and voltage divider; simulation of common emitter amplifier with voltage divider bias using LTspice software; numerical on biasing circuits; construction and characteristics of n-channel depletion type MOSFET;

(Textbook 1: Chapter 3: 3.1 to 3.5, Chapter 4: 4.1 to 4.5, Chapter 6.1 and 6.7)

UNIT – III	**08 Hours**

Operational amplifiers: Op-amp symbols, terminals and operation: single mode, differential mode and common mode; basic properties of ideal and practical Op-amp: input offset voltage, input resistance, output resistance, gain, bandwidth, CMRR, slew rate; basic Op-map applications: inverting amplifier, non-inverting amplifier, summing amplifier, differential amplifier, differentiator and integrator; Op-amp comparator; feedback: positive and negative feedback; criteria for stability and oscillations (Barkhausen criterion); RC phase shift and Wein bridge oscillators; simulation of summing amplifier and oscillators in LTspice software;

(Textbook 1: Chapter 10: 10.1, 10.4 to 10.7, Chapter 14: 14.5 to 14.7)

UNIT – IV	**08 Hours**

Digital Electronics: Binary number system: conversion and representation; logic levels: high and low; Boolean algebra: operators and DeMorgan's law; logic gates with truth-table and representation: AND, OR, NOT, XOR, NAND, NOR; combination of gates and associated numerical; sequential logic circuits: SR latch using NAND/NOR gate, SR FLIP-FLOP, J-K Flip-Flop, D Flip-Flop; application of Flip-Flops: 4 bit binary counter and 4 stage shift register; simulation of counter using LTspice; (Textbook 2: Chapter 1: 1.1 to 1.3, Chapter 2: 2.1 to 2.5, Chapter 4: 4.1 to 4.3, Chapter 5.1 to 5.5, Chapter 6.1 to 6.4)

UNIT – V	**06 Hours**
Electronic Prototyping with Arduino: Introduction to microprocessor and microcontrollers (Architecture) , introduction to the Arduino board (UNO, R3) and components; setting up the Arduino development environment; writing and running a simple Arduino program in *wokwi* environment; introduction to various sensors and actuators compatible with Arduino in *wokwi* environment; student project: Designing and implementing a complete Arduino-based system. E-Resources: 1 and 2	

Course Outcome	**Description**	**Bloom's Taxonomy Level**
At the end of the course the student will be able to:		
1	**Demonstrate** a solid understanding of the fundamental principles underlying electronic components, such as diodes, transistors, operational amplifiers, logic gates, and microcontrollers.	L2
2	Apply knowledge of electronic components to **analyze** circuits for various applications, such as rectification, amplification, filtering, and digital logic operations.	L4
3	**Analyze** the performance of operational amplifiers (Op-amps) in various circuit configurations, including amplifiers, comparators, and oscillators, to optimize their functionality and address design requirements.	L4
4	Demonstrate proficiency in using simulation software (e.g., LTspice) to simulate and **analyze** electronic circuits, validate designs, and troubleshoot circuit performance**.**	L4
5	**Design** and implement electronic systems using Arduino microcontrollers, integrating sensors, actuators, and programming concepts to achieve specific functionalities and solve practical problems.	L6

Table: Mapping Levels of COs to POs / PSOs

COs	**Program Outcomes (POs)**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1		3							2	3		
CO2	3	3	2	1	3							2	3		
CO3	3	3	2	2	3							2	3	2	

CO4	3	3	2	2	3							2	3	2	
CO5	3	3	3	1	3							3	3	3	

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXT BOOKS:

1. R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", 11th Ed, Pearson Education, 2013.
2. M. Moris. Mano and Michael D. Ciletti, "Digital Electronics", 4th Ed, Pearson Education, 2006.

REFERENCE BOOKS:

1. David A Bell, "Electronic Devices and Circuits", 5th Ed, Oxford university press, 2008.
2. Millman & Halkias, "Electronics Devices and Circuits", 2nd Ed, McGraw Hill, 2010.

E-Resources:

1. Arduino- https://docs.arduino.cc/learn/
2. Wokwi- https://wokwi.com/arduino/
3. NPTEL- https://nptel.ac.in/courses/122/106/122106025
4. Virtual Labs- http://vlabs.iitkgp.ac.in/be/

Activity Based Learning (Suggested Activities in Class):

4. Real world problem solving using group discussion and hands-on activities. E.g., Interfacing different types of sensors using Arduino.
5. Simulation of different electronic circuits. E.g., Rectifiers and Amplifiers.

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OBJECT ORIENTED PROGRAMMING

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – II

Course Code Code	:		**Credits**	:	04
Hours / Week	:	03 Hours	**Total Hours**	:	26(L)+26(P) Hours
L–T–P–J	:	2–1–2–0			

Course Learning Objectives:

This Course will enable students to:

1. **Understand** different programming paradigms, significance of object-oriented programming approach and their applications. (L2)
2. **Make use of** Python programming environment to develop programs using conditionals, iterations, functions, strings and files to store and retrieve data in system. (L3)
3. **Gain** skills to develop python programs using core data structures like Lists, Tuples, Sets and Dictionaries. (L3)
4. **Describe** the concepts of object-oriented concept using class, objects, methods. Polymorphism and different levels of inheritance. (L2)
5. **Explain** operator overloading, overriding, single and multiple exception handling capabilities in python. (L2)

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

UNIT – I	**05 Hours**

INTRODUCTION TO OBJECT ORIENTED PROGRAMMING AND PYTHON

Programming paradigms, Object oriented programming features, applications, merits & demerits, Features of Python, variables, Data types, input operation, Reserved words, Indentation, Expressions, String operations, Type conversions.

(Text Book-1: Chapter 2: 2.3,2.4,2.5,2.6 Chapter 3: 3.1,3.6,3.7,3.8,3.10,3.11,3.13,3.14,3.16)

DECISION AND LOOP CONTROL STATEMENTS:

Conditional branch statements, Iterative statements, Nested loops, break, continue, pass, The else statement used with loops.

(Text Book-1: Chapter 4: 4.1-4.8)

UNIT – II	5 Hours
FUNCTIONS AND MODULES: Need for functions, Function definition, Function call, Scope, Return statement, Lambda functions, Recursive functions, Modules. ***(Chapter 5: 5.1 to 5.11)*** **PYTHON STRINGS:** String operations, Immutable, string formatting operator, built-in string methods, string slices, membership operator, comparing strings, Iterating strings. ***(Chapter 6: 6.1 to 6.9***)	
UNIT – III	**6 Hours**
DATA STRUCTURES IN PYTHON: Sequence, List, Tuple, sets, dictionaries ***(Chapter 8: 8.1, 8.2, 8.4 to 8.6)*** **FILE HANDLING METHODS:** File path, File types, File operations, File positions, Rename and delete files. ***(Chapter 7: 7.1 to 7.7)***	
UNIT – IV	**5 Hours**
USER DEFINED CLASSES & OBJECTS: Classes, Objects, class method and self Argument, constructor, destructor, class variables, public and private data members, private methods, Calling methods, static methods. ***(Chapter 9: 9.1 to 9.10, 9.15)*** **INHERITANCE:** Introduction, Polymorphism, overriding, types of inheritance ***(Text Book: Chapter 10: 10.1 to 10.6)***	
UNIT – V	**5 Hours**
OPERATOR OVERLOADING: Introduction, Implementation of operator overloading, Reverse addition, overriding methods and functions. ***(Text Book: Chapter 11: 11.1 to 11 .7***) **ERROR AND EXCEPTION HANDLING:** Errors, Handling exceptions, Multiple except blocks, Multiple exceptions, Except block without exception, The else clause, Raising exceptions, Built-in and user defined exceptions, Finally block, clean-up action ***(Text Book: Chapter 12: 12.1 to 12.7, 12.10 to 12.12***)	

Course Outcomes:

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

Write a python program using 4 conditionals, definite loop, indefinite loop with jump statements.

Write an application using lambda, recursive functions, strings and files to store and retrieve the data from the system.

Write python programs using Core data structures like Lists, Tuples, Sets and Dictionaries.

Implement the concepts of object-oriented concept using class, objects, methods. Polymorphism and different levels of inheritance.

Implement operator overloading, overriding, single and multiple exception handling

Table: Mapping Levels of COs to POs / PSOs

COs	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2	1		2					1				
CO2	3	2	1		2					1		2	1	
CO3	3	2	2		2					1		2	1	
CO4	3	2	2		2					1		2	1	
CO5	3	2	2		2					1		2	1	

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXT BOOKS:

1. Reema Thareja, “Python programming: Using problem solving approach”, 2nd Edition, Oxford university press, 2019.

REFERENCE BOOKS:

1. John V Guttag, “Introduction to Computation and Programming Using Python”, The MIT press, 3rd edition, 2021.
2. Tony Gaddis, “Starting out with python”, 4th edition, Pearson, 2019.
3. Allen Downey, Jeffrey Elkner and Chris Meyers, "How to think like a Computer Scientist, Learning with Python", Green Tea Press, 2014.
4. Richard L. Halterman, “Learning to Program with Python”, 2011.
5. Charles Dierbach, “Computer Science Using Python: A Computational Problem- Solving Focus”, John Wiley, 2012.

Activity Based Learning (Suggested Activities in Class)

1. Real world problem solving and puzzles using group discussion.
2. Demonstration of solution to a problem through programming.

List of Programming experiments:

1. Develop a python program to:
   a) Read and print data of different types using variables.
   b) Evaluate different types of expressions in python.
2. Develop a python program to:
   a) Calculate roots of a quadratic equation.
   b) Read the numbers until -1 is encountered. Also find the count and average of the positives, negatives, zeros entered by user.
3. Develop a python program to:
   a) Demonstrate the functions with required, keyword, default and variable- length arguments.
   b) Calculate GCD and exponents using recursive functions.
   c) Illustrate the creation of built-in and user defined modules using **'from'** and '**import'** keywords.
4. Develop a python program to:
   a) Demonstrate slicing operations on string objects using both positive and negative indexes.
   b) Read PAN card number and User name. Validate the information using isX function and print the details.
   c) Parse an email ID to find out an email server name and the time sent.
   d) Demonstrate the use of different methods on string objects.
5. Develop a python program to:
   a) Accept a filename as input from the user, open the file and find the frequency of each character in a file.
   b) To copy the python script from source file to destination file such that all the comments are skipped from source file to destination file.
6. Develop a python program to:
   a) Implement the stack and queue using list data structure.
   b) Use the different built-in methods/functions on tuple objects.
   c) Use the different built-in methods/functions on set objects.
   d) Use the different built-in methods/functions on dictionary objects.
7. Develop a python program to:
   a) Illustrate the __init__ and __del and other special methods in object-oriented python.
   b) Illustrate the use of private and public data members with private methods.
   c) Illustrate the different types of inheritance in object-oriented python.
8. Develop a python program to:
   a) Overload the + operator on a class student that has attributes name & marks.
   b) Illustrate the Overriding of __getitem__, __setitem__ and __call__methods.
9. Develop a python program to:
   a) Illustrate the try, except, else and finally blocks all together
   b) Create the subclasses of Exception class to handle exceptions in a better customized way.
   c) Validate the name and age as entered by the user to determine whether person can cast

vote or not by raising the appropriate exceptions.

ENGINEERING GRAPHICS & DESIGN THINKING

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – I/II

Subject Code	:	**Credits**	: 03
Hours / Week	: 05 Hours	**Total Hours**	: 14+56 Hours
L–T–P–J	: 1–0–4–0		

Course Learning Objectives:

This Course will enable students to:

1. **Create** awareness and emphasize the need for Engineering Graphics & design thinking through Manual Sketching & Autocad Software
2. **Learn** using professional CAD software for construction of geometry
3. **Understand** the concepts of orthographic and isometric projections
4. **Draw** orthographic projection of points, lines, planes and solids by Manual Sketching & AutoCad Software
5. **Draw** development of surfaces of solids
6. **Draw** isometric projections of planes and solids
7. **Create** simple engineering 3D components
8. **Work** in a team for creating conceptual design of products
9. **Learn** application of design methods and tools on real world problem through Autocad Software & Physical Models

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
6. Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
7. Show the ***different ways to solve*** the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

MANUAL & COMPUTER SKETCHING	
UNIT – I Introduction	**06 Hours**
Introduction to Engineering Graphics: Fundamentals, Drawing standard - BIS, dimensioning, Lines, lettering, scaling, symbols, dimensioning & tolerances, conventions, Introduction to orthographic projection. Types of projections & their principles - (For CIA only) **(For CIA only)** ***(Text Book-1: Chapter 3 & 8)*** **Introduction to Computer Aided Drafting software**- Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, coloring, mirror, rotate, trim, extend, break, chamfer, fillet and curves - **(For CIA only)** ***(Text Book-2: Chapter 23 &24; Text Book-1: Chapter 26)***	
UNIT – II Projections of Points, Lines and Planes	**12 Hours**
Projection of Points - Orthographic projections of points in all the quadrants, **Orthographic projections of lines**- inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method. **Orthographic projections of planes** -triangle, square, rectangle, pentagon, hexagon and circular laminae. ***(First Angle Projection only)*** ***(Text Book-1: Chapter 9,10,12)***	
UNIT – III Projection of Solids & Development of Surfaces	**18 Hours**
Projection of regular solids like prisms, pyramids, cylinder & cone inclined to both the planes (change of position method) ***(First Angle Projection only)*** ***(Text Book-1: Chapter 13)*** **Development of lateral surfaces of regular solids** – Prisms, pyramids cylinders and cones. ***(Text Book-2: Chapter 16)***	
UNIT – IV Isometric Projections	**18 Hours**
Isometric projection - Principles of Isometric Projection, Isometric Scale, Isometric View, Isometric projection of combination of two solids ***(Text Book-1: Chapter 17)*** **Transformation of Projections-** Conversion of Isometric Views to Orthographic Views & Conversion of orthographic views to isometric projections. ***(Text Book-1: Chapter 20; Text book- 2: Chapter 21)***	
UNIT – V Introduction to Design Thinking for Innovations	**16 Hours**
A brief history of Design, Engineering Design process, Product development cycle, creation of models and their presentation in standard 3D view. Theory, Practice & Examples in Design	

thinking, Storytelling, Creativity and Idea Generation, Concept Development, Testing and Prototyping. **(For CIA only)** ***(Text Book-3: Part 1- Chapter 1&2, Part3-Chapter 10)***

Course Outcome	Description	Bloom's Taxonomy Level
At the end of the course the student will be able to:		
1	**Make use of** instruments, dimensioning & tolerance principles, conventions and standards related engineering drawing	L1
2	**Construct** orthographic projections of points, lines, planes and solids	L3
3	**Develop** lateral surfaces of solids and **construct** isometric projections of solids	L3
4	**Apply** the design thinking principles for innovative product development	L3
5	**Make use of** AutoCad for modelling engineering components	L3

Table: Mapping Levels of COs to POs / PSOs

COs	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	1	0	0	0	0	0	0	0	0	0	0	3	0	2
CO2	2	1	0	0	0	0	0	0	0	0	0	0	3	0	2
CO3	2	1	0	0	0	0	0	0	0	0	0	0	3	0	2
CO4	2	1	0	0	0	0	0	0	0	0	0	0	3	0	2
CO5	3	1	0	0	0	0	0	0	0	0	0	0	3	0	2

3: Substantial (High) **2: Moderate (Medium)** **1: Poor (Low)**

TEXT BOOKS:

1. Engineering Drawing, Bhatt N.D., 54th Edition, Charotar Publishing House, Gujarat, India, 2023
2. Engineering Drawing & Graphics+Autocad, K Venugopal, Fifth Edition, New Age International Publishers, 2011.
3. Engineering Design- A Project Based Introduction, C. L. Dym and Patrick Little, John Wiley & Sons, 2022

REFERENCE BOOKS:

1. A Textbook of Computer Aided Engineering Drawing, Gopalakrishna, K. R. and Sudheer Gopala Krishna, Subash Publishers, Bangalore, India, 2017
2. Engineering Drawing with Introduction to AutoCAD, Dhananjay .A .J, Tata McGraw-Hill Publishing Company Ltd, 2018

3. Product Design and Development, Karl T Ulrich, Steven D Eppinger, Seventh Edition, McGraw-Hill Education, 2020

E-Resources:

1. https://archive.nptel.ac.in/courses/112/102/112102304/
2. https://nptel.ac.in/courses/112103019
3. https://nptel.ac.in/courses/112/105/112105294/
4. https://fractory.com/engineering-drawing-basics/

Activity Based Learning (Suggested Activities in Class)

1. Activity which makes students to apply the concepts learned in the course to the practical engineering graphics will be discussed in class.
2. Activity provides space to students giving responsibility for their own design & engineering drawing methods for the products
3. Activity that makes the students for the development of skill set in computer drafting
4. Activity that makes the students to have critical thinking, developing a mind set, problem-solving and teamwork in design thinking process.
5. Real world problem solving and puzzles using group discussion.
6. Demonstration of solution to a problem through experiential learning.

ENGINEERING GRAPHICS & DESIGN THINKING

LABORATORY

Total Contact Hours: 56

Following are practical/laboratory experiments to be carried out:

1. Problems to be solved in first quadrant system.
2. Manual & Computer Sketching problems for all the modules in sketch book and also take print out of the problems.
3. Usage of various commands in AutoCad software and few simple exercises on the above commands
4. Practice Problems on Projections of Points, Lines and Planes using Manual Sketching & AutoCad Software
5. Solve Problems on Projection of Solids & Development of Surfaces
6. Practice problems on Isometric Projections
7. Individual/Group work on Introduction to Design Thinking for Innovations (Examples on

Solid Modeling - Using 3D Modelling Software & Physical Model Prototype).

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BIOLOGY FOR ENGINEERS [As per Choice Based Credit System (CBCS) scheme] **SEMESTER – I/II**				
Subject Code	:		**Credits**	: 02
Hours / Week	: 02 Hours		**Total Hours**	: 28 Hours
L–T–P–J	: 2–0–0–0			

Course Learning Objectives:

This Course will enable students to:

1. Acquire an understanding on basic modern biological concepts with an emphasis on how bio-processes are analogous to engineering field, as a multidisciplinary field.
2. Understand basic engineering principles imminently run physiological processes particularly about engineering designs and solutions are arrived citing body functional examples.
3. Explain aspects that many bio-solutions could be foundational to design, develop better processes, products and useful to achieve quality of life.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* like power point presentations and group discussion may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three higher order thinking questions in the class.

6. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

COURSE CONTENT:	
UNIT 1 : Biomimetics	**6 Hrs**
Biology for Engineers, Body Fluid: Blood- Mechanics of heart, Blood pressure, Life molecules: Water, Carbohydrates, Proteins, Lipids and Nucleic acids, Biomimetics: Bio-processes - engineering analogies	
UNIT 2 : Bioenergy	**6 Hrs**
Unit of life: Human and Plant cell, Metabolism: Enzymes as Bio-catalysts and physiological entities, Anabolism- Bioenergy from Sun-Photosynthesis, catabolism	
UNIT 3 : Biomechanics (Human Body Movement Mechanics)	**5 Hrs**
Normal Human Movement: Force-Vector of Body; Movement Angles; Muscle contraction - Relaxation; Posture – Static & Dynamic; Ideal and abnormal posture, Practical: Stepping-Lifting-Sit-Stand.	
UNIT 4 :Bioelectronics	**6 Hrs**
Brain & Computer: Senso-neural networks, Biosensors and IoT as applied to biology, Bionic Eye: Mechanism of Vision, Electronic Nose: Bio-olfactory mechanisms (Science of smell), Impulses: Cardiac and Nerve, Biological Clock and Circadian rhythm	
UNIT 5 : Biopharma	**5 Hrs**
Metabolic syndromes, Cancer and its diagnostics, Lab on a chip, Drug Discovery	

Course Outcome	**Description**	**Bloom's Taxonomy Level**
At the end of the course the student will be able to:		
1	**Apply and Utilize** essential knowledge of the biological mechanisms of living organisms from the perspective of engineers and find solutions to solve bio-engineering problems with appropriate tools.	L3
2	**Distinguish and make use of** optimal designs in engineering that are bio-mechanical in nature and build and use by observing and understanding bio-physiological processes involved in sensing, locomotion, and knowledge application of range of bio-chemicals.	L3
3	**Demonstrate** that bio-chemical, bio-sensory, bio-processes could be path-finders to optimise similarities for functional	L3

	aspects of electronic, computer, mechanical, electrical machines.	

Activity Based Learning (Suggested Activities in Class)

1. Real world problem solving and puzzles using group discussion.
2. Demonstration of solution to a problem through experiential learning.
3. Demonstrations using real objects, taking students on an educational tour.

REFERENCES:

1. Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M,L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson. "Biology: A global approach", , Global Edition, 10/E, 2014
2. David Nelson, Michael Cox. "Lehninger Principles of Biochemistry". W H Freeman & Company, Seventh Edition, 2017.
3. Janine M Benvus. "Biomimicry: Innovation inspired by Nature". William Morrow Paperbacks, 2002.
4. Lecture Notes, PPT slides by course instructor.

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CONSTITUTION OF INDIA, AND ENGINEERING ETHICS [As per Choice Based Credit System (CBCS) scheme] **SEMESTER – I/II**			
Subject Code	:	**Credits**	: 01
Hours / Week	: 01 Hours	**Total Hours**	: 13 Hours
L–T–P–J	: 1–0–0–0		

Course Learning Objectives:

This Course will enable students to:

1. Acquaint the students with legacies of constitutional development in India and help those to understand the most diversified legal document of India and philosophy behind it.
2. Make students aware of the theoretical and functional aspects of the Indian Parliamentary System.
3. Channelize students' thinking towards basic understanding of the legal concepts and its implications for engineers.
4. Acquaint students with latest legislation and Laws with related regulatory framework.

Teaching-Learning Process (General Instructions)

These are sample new pedagogical methods, where teacher can use to accelerate the attainment of the various course outcomes.

1. ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* like power point presentations and group discussion may be adopted to develop the course outcomes.
2. ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
3. Show ***Video/animation*** films to explain functioning of various concepts.
4. Encourage ***Collaborative*** (Group Learning) Learning in the class.
5. To make ***Critical thinking***, ask at least three higher order thinking questions in the class.
6. Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.

COURSE CONTENT	
UNIT 1 : Introduction and Basic Information about Indian Constitution	**6 Hrs**
Meaning of the constitution law and constitutionalism, Historical Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947, Enforcement of the Constitution, Indian Constitution and its Salient Features, The Sources of Indian Constitution. The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Parliamentary System, Federal System, Centre-State Relations, Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency, and Local Self Government – Constitutional Scheme in India.	
UNIT 2 : Union Executive and State Executive	**7 Hrs**
Powers of Indian Parliament Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Powers and Functions of the Prime Minister, Judiciary – The Independence of the Supreme Court, Appointment of Judges, Judicial Review, Public Interest Litigation, Judicial Activism, LokPal, Lok Ayukta, The Lokpal and Lok ayuktas Act 2013, State Executives – Powers and Functions of the Governor, Powers and Functions of the Chief Minister, Functions of State Cabinet, Functions of State Legislature, Functions of High Court and Subordinate Court	

Course Outcome	**Description**	**Bloom's Taxonomy Level**
At the end of the course the student will be able to:		

1	Identify and explore the basic features and modalities about Indian constitution.	L1
2	Differentiate and relate the functioning of Indian parliamentary system at the Centre and State level.	L2
3	Differentiate different aspects of Indian Legal System and its related bodies.	L2
4	Discover and apply different laws and regulations related to engineering practices.	L1
5	Correlate role of engineers with different organizations and governance models	L1

TEXT BOOKS:

1. The Indian Constitution, Madhav Khosla, Oxford University Press.
2. The Constitution of India, PM Bakshi. Latest Edition, Universal Law Publishing.

REFERENCE BOOKS:

1. The Indian Constitution: Cornerstone of a Nation (Classic Reissue), Granville Austin:, Oxford University Press.
2. Our Constitution: An Introduction to India's Constitution and Constitutional Law, Subhash C. Kashyap, NBT, 2018.
3. Introduction to the Indian Constitution, Brij Kishore Sharma, 8th Edition, PHI Learning Pvt. Ltd.