# COURSE STRUCTURE
# AND
# DETAILED SYLLABUS

## I-B.TECH-I&II SEMESTERS

## MECHANICAL ENGINEERING

**R18 Regulations**

**FOR**
**B. Tech FOUR YEAR DEGREE COURSE**
**[Choice Based Credit System (CBCS)]**
(Applicable for the batches admitted from 2018-2019 Onwards)


## ANURAG GROUP OF INSTITUTIONS

**(AUTONOMOUS)**

**VENKATAPUR, GHATKESAR, HYDERABAD – 500 088, TELANGANA STATE**

## Definitions of Key Words:

**Academic Year**: Two consecutive (one odd + one even) semesters constitute one academic year.

**Choice Based Credit System (CBCS)**: The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).

**Course**: Usually referred to, as „papers" is a component of a programme. All courses need not carry the same weightage. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/ tutorials/laboratory work/ field work/ outreach activities/ project work/ vocational training/viva/ seminars/ term papers/assignments/ presentations/ self- study etc. or a combination of some of these.

**Credit Based Semester System (CBSS)**: Under the CBSS, the requirement for awarding a degree or diploma or certificate is prescribed in terms of number of credits to be completed by the students.

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

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

**Credit Point**: It is the product of grade point and number of credits for a course.

**Letter Grade**: It is an index of the performance of students in a said course.

Grades are denoted by letters O, A+, A, B+, B, C, P and F.

**Semester Grade Point Average (SGPA)**: It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.

**Cumulative Grade Point Average (CGPA)**: It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

**Programme**: An educational programme leading to award of a Degree, diploma or certificate.

**Semester:** Each semester shall consist of 16 weeks of instruction. The odd semester may be scheduled from June to November and even semester from December to May.

**Transcript or Grade Card or Certificate:** Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester.

**Types of Courses**: The Courses in a programme may be of three kinds: Core, Elective and Foundation.

**Core Course:-**

This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirement of a programme in a said discipline of study.

**Elective Course:-**

Elective course is a course which can be chosen from a pool of papers. It may be:

- Supportive to the discipline of study
- Providing an expanded scope
- Enabling an exposure to some other discipline/domain
- Nurturing student‟s proficiency/skill.

An elective may be "Generic Elective" focusing on those courses which add generic proficiency to the students. An elective may be "Discipline centric" or may be chosen from an unrelated discipline. It may be called an "Open Elective."

**Foundation Course:-**

The Foundation Courses may be of two kinds: Compulsory Foundation and Elective foundation. "Compulsory Foundation" courses are the courses based upon the content that leads to Knowledge enhancement. They are mandatory for all disciplines. Elective Foundation courses are value-based and are aimed at man-making education.

# ACADEMIC REGULATIONS FOR B. TECH. (REGULAR)

Applicable for the students of B. Tech. (Regular) from the Academic Year 2018-19 onwards

## 1. Title and Duration of the Course

The course shall be called the degree course in Bachelor of Technology, abbreviated as B.Tech.

The course shall be of four academic years duration divided into eight semesters, each semester having duration of minimum 16 weeks of instruction.

The calendar of events in respect of the course shall be fixed by the Institute from time to time.

The external examination in all the subjects shall be conducted at the end of each semester for all the eight semesters.

Students joining the B.Tech. Programme shall have to complete the programme within a stipulated time frame of 8 years from the year of joining and Students joining the B.Tech. Programme in the third semester directly through Lateral Entry Scheme (LES) shall have to complete the programme within a stipulated time frame of 6 years from the year of joining. Otherwise they shall forfeit their seat in B.Tech Programme and their admission shall stand cancelled.

## 2. Admission Procedure

Admissions shall be done as per the norms prescribed by the Government of Telangana State.

The Government orders in vogue shall prevail.

The candidate should have passed the prescribed qualifying examination on the date of admission.

## 3. Award of B. Tech. Degree

A student shall declared eligible for the award of B. Tech. Degree if he fulfills the following academic requirements:

The candidate shall pursue a course of study for not less than four academic years and not more than eight academic years.

The candidate shall register for 160 credits and secure all the 160 credits by securing a minimum CGPA of 5.0.

The students, who fail to fulfill the academic requirements for the award of the degree within eight academic years from the year of admission, shall forfeit their admission in B.Tech. Course.

## 4. Courses of Study

The following B. Tech. Courses are offered at present:

| Branch | Branch Code |
|---|---|
| Civil Engineering | 01 |
| Electrical and Electronics Engineering | 02 |
| Mechanical Engineering | 03 |
| Electronics and Communication Engineering | 04 |
| Computer Science and Engineering | 05 |
| Chemical Engineering | 08 |
| Information Technology | 12 |

and any other course as approved by the Authorities from time to time.

## 5. Credits

| | Semester | |
|---|---|---|
| | **Contact Periods / week** | **Credits** |
| Theory | 04 | 04 |
| | 03 | 03 |
| | 02 | 02 |
| Practical | 03<br>02 | 1.5<br>01 |
| Drawing | 00+04<br>02+02<br>00+06 | 02<br>03<br>03 |
| Mini project | -- | 02 |
| Comprehensive Viva Voce | -- | 02 |
| Seminar | 6 | 02 |
| Project | 15 | 10 |

## 6. Distribution and Weightage of Marks

The performance of a student in a semester shall be evaluated subject-wise for a maximum of 100 marks each for a theory and practical subject. In addition, industry-oriented mini-project, seminar, Comprehensive Viva-Voce and project work shall be evaluated for 100 marks each.

For theory subjects the distribution shall be 25 marks for Continuous Internal Evaluation (CIE) and 75 marks for the Semester End- Examination (SEE).

For theory subjects, during the semester there shall be 2 midterm examinations as part of continuous evaluation. Each midterm examination consists of Part-A (Short Answers) for 5 marks and Part-B (Long Answers) for 15 marks with duration of 90 Minutes and an assignment carrying 5 marks.

Part-B shall contain 5 questions of which student has to answer 3 questions each 5 marks. First midterm examination shall be conducted for 2.5 units of syllabus at end of 8 weeks instruction and second midterm examination shall be conducted for remaining 2.5 units at the end of 16 weeks instruction. First Assignment should be submitted before the conduct of the first mid, and the second Assignment should be submitted before the conduct of the second mid.

There shall be an optional third midterm examination during the preparation cum external practical examinations period subject to the following.

i. Interested students have to register for the third mid examination by paying prescribed registration fee.
ii. Third midterm examination covers entire semester syllabus carrying 20 marks.

The average of best two midterm examinations shall be taken as the final marks secured by each candidate**.** The average two assignments for 5 marks shall be added to the final mid marks. If he/she is absent for any test / assignment, he/she shall be awarded zero marks for that test / assignment.

The Semester End Examination will be conducted for 75 marks which consists of two parts viz. i). Part-A for 25 marks, ii). Part –B for 50 marks.

Part-A is compulsory, which consists of ten questions (numbered from 1 to 10) two from each unit carrying 2/3 marks each.

Part-B consists of five questions (numbered from 11 to 15) carrying 10 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice (that means there will be two questions from each unit and the student should answer any one question).

For practical subjects there shall be a continuous evaluation during a semester for 25 sessional marks. Out of the 25 marks for internal evaluation, day-to-day work in the laboratory shall be evaluated for 15 marks and internal practical examination shall be evaluated for 10 marks conducted by the laboratory teacher concerned. Semester end examination carries 75 marks.

The practical end semester examination shall be conducted with an external examiner along with one internal examiner. The external examiner shall be appointed by the Director/Dean, Examinations from the panel of examiners recommended by Chairman, Board of Studies in the respective branch/discipline.

For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 25 marks for internal evaluation (15 marks for day-to-day work and 10 marks for internal tests) and 75 marks for end examination. There shall be two internal tests in a Semester and the average of the best two shall be considered for the award of marks for internal

tests (As per item 6.3, third midterm examination will be conducted).

There shall be an industry-oriented mini-Project, to be taken up during the vacation after III year II Semester examination. However, the mini project and its report shall be evaluated in IV year I Semester. The industry oriented mini project shall be submitted in report form and should be presented before the committee, which shall be evaluated for 100 marks. The committee consists of an external examiner, head of the department, the supervisor of mini project and a senior faculty member of the department. There shall be no internal marks for industry oriented mini project.

There shall be a seminar presentation in IV year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding of the topic, and submit it to the department. It shall be evaluated by the departmental committee consisting of Head of the Department, Seminar Supervisor and a Senior Faculty member. The seminar report shall be evaluated for 100 marks. There shall be no external examination for the seminar.

There shall be a Comprehensive Viva-Voce in IV year II semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members of the Department. The Comprehensive Viva-Voce is intended to assess the students understanding of the subjects he studied during the B. Tech. course of study. The Comprehensive Viva-Voce is evaluated for 100 marks by the departmental Committee. There are no external marks for the Comprehensive Viva-Voce.

Out of a total of 100 marks for the project work, 25 marks shall be for Internal Evaluation and 75 marks for the End Semester Examination. The End Semester Examination (viva-voce) shall be conducted by the committee. The committee consists of an external examiner, head of the department, the supervisor of project and a senior faculty member of the department. The topics for industry oriented mini project, seminar and project work shall be different from each other. The evaluation of project work shall be conducted at the end of the IV year II Semester. The internal evaluation shall be on the basis of two seminars given by each student on the topic of his project**.**

The Laboratory marks and the sessional marks awarded by the faculty are subject to scrutiny and scaling by the Institution whenever/wherever necessary. In such cases, the sessional and laboratory marks awarded by the teacher will be referred to a committee consisting of Director, CBOS/HOD, Dean Examinations/COE and Subject Expert. The committee will arrive at a scaling factor and the marks will be scaled accordingly. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved as per the University rules and produced before the Committees of the University as and when asked for.

Candidates shall be permitted to apply for recounting/revaluation of SEE scripts within the stipulated period with payment of prescribed fee.

## 7. Attendance Requirements

A student is eligible to write the Semester end examinations only if he / she acquires a minimum of 75% of attendance in aggregate of all the subjects.

Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted on medical grounds as approved by the Academic Council

A stipulated fee shall be payable towards condonation of shortage of attendance.

Shortage of attendance below 65% in aggregate shall not be condoned .

Students whose shortage of attendance is not condoned are not eligible to write semester end examinations of that semester. Such students are detained and their registration for examination stands cancelled.

A student detained due to shortage of attendance in a semester may seek re-admission into that semester, as and when offered, within four weeks from the date of the commencement of class work with the academic regulations of the batch into which he/she gets admitted.

A student will be promoted to the next semester if he/she satisfies the attendance requirement of the present semester and shall not be eligible for readmission into the same semester.

For all mandatory, non credit courses offered in a semester, a "Satisfactory Participation Certificate" shall be issued to the student from the concerned authorities, only after securing $\geq$ 75% attendance in such a course. No marks or Letter Grade shall be allotted for these activities (Refer to 15.2).

## 8. Minimum Academic Requirements

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.7.

A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/practical/design/drawing subject/project and secured not less 35% marks in semester end examination (SEE), and minimum 40% of marks in the sum total of the internal evaluation and end examination taken together.

The student has to pass the failed course by appearing the supplementary examination as per the requirement for the award of degree.

Students who fail to earn 160 credits as indicated in the course structure within eight academic years from the year of their admission, shall forfeit their admission in B. Tech. course.

A student shall be promoted from I Year to II Year only if he/she fulfills the academic requirements of securing 50% of average credits (19 credits out of 38 credits) upto I year II Semester, from all the examinations, whether or not the candidate takes the examinations.

A student shall be promoted from II Year to III Year only if he/she fulfills the academic requirements of securing 60% of average credits (35 credits out of 58 credits) up to II year I semester, from all the examinations, whether or not the candidate takes the examinations.

A student shall be promoted from III year to IV year only if he/she fulfills the academic requirements of securing 60% of average credits (59 credits out of 98 credits) up to III year I semester, from all the examinations, whether or not the candidate takes the examinations.

A student shall register and put up attendance in all 160 credits and earn all 160 credits for the award of degree.

When a Student is detained due to shortage of attendance in any semester, no Grade Allotments or SGPA/CGPA calculations will be done for that entire Semester in which he got detained.

When a Student is detained due to lack of Credits in any year, he may be readmitted after fulfillment of the Academic Requirements, with the Academic Regulations of the Batch into which he gets readmitted subject to 3.3.

For readmitted candidates, if there are any Professional Electives / Open Electives, the same may also be re-registered if offered. However, if those Electives are not offered in later Semesters, then alternate Electives may be chosen from the set of Elective Subjects offered under that category.

If a Student registers for some more „extra Subjects" (in the parent Department or other Departments/Branches of Engg.) other than those listed Subjects totaling to 160 Credits as specified in the Course Structure of his Department, the performances in those „extra Subjects" (although evaluated and graded using the same procedure as that of the required 160 Credits) will not be taken into account while calculating the SGPA and CGPA. For such „extra Subjects" registered, Letter Grade alone will be indicated in the Grade Card, as a performance measure, subject to completion of the Attendance and Academic Requirements as stated in Items 7 and 8.1 – 8.10 above.

## 9. Program Structure

| S. No. | Classification | | Course Work - Subject Area | Range of Total Credits (%) | |
|---|---|---|---|---|---|
| | AICTE | UGC | | Min | Max |
| 1 | HS | Foundation Courses | Humanities and Social Sciences including Management; (HS), | 5 | 10 |
| 2 | BS | | Basic Sciences(BS) including Mathematics, Physics, Chemistry, Biology; | 15 | 20 |
| 3 | ES | | Engineering Sciences (ES), including Materials, Workshop, Drawing, Basics of Electrical/ Electronics/ Mechanical/Computer Engineering Instrumentation; | 15 | 20 |
| 4 | PC | Core Courses | Professional Subjects-Core (PC), relevant to the chosen specialization/branch; (May be split into Hard (no choice) and Soft (with choice), if required ;) | 30 | 40 |
| 5 | PW | | Project Work, Seminar and/or Internship in Industry or elsewhere. | 10 | 15 |
| 6 | PE | Elective Courses | Professional Subjects – Electives (PE), relevant to the chosen specialization/ branch; | 10 | 15 |
| 7 | OE | | Open Subjects- Electives (OE), from other technical and/or emerging subject areas; | 5 | 10 |

## 10. Course pattern

The entire course of study is for four academic years in semester pattern.

A student eligible to appear for semester end examinations in a subject, but absent from it or failed in that examination, may write the exam in that subject during supplementary exams.

A student eligible to appear in the End Semester Examination in any Subject / Course, but absent at it or failed(thereby failing to secure C Grade or above), may reappear for that Subject / Course at the supplementary as and when examination conducted. In such cases, his Internal Marks(CIE) assessed earlier for that Subject/Course will be carried over, and added to the Marks to be obtained in the supplementary examinations, for evaluating his performance in that subject.

## 11. Minimum Instruction

The minimum instruction for each semester shall be 16 weeks.

## 12. Grade Points

Marks will be awarded to indicate the performance of each student in each theory subject, or Lab/Practicals, or Seminar, or Project, or Mini-Project, Minor Course etc., based on the % marks obtained in CIE+SEE(Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 6 above, and a corresponding Letter Grade shall be given.

As a measure of the student‟s performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed.

| Letter Grade | Grade Points | % of marks Secured (Class Intervals) |
|---|---|---|
| **O** ( Out Standing) | 10 | 90% and above (≥90%, ≤ 100% ) |
| **A+** ( Excellent) | 9 | Below 90% but not less than 80% (≥80%, <90%) |
| **A** ( Very Good) | 8 | Below 80% but not less than 70% (≥70%, < 80%) |
| **B+** (Good) | 7 | Below 70% but not less than 60% (≥60%, < 70%) |
| **B** (Average) | 6 | Below 60% but not less than 50% (≥50%, < 60%) |
| **C** ( Pass) | 5 | Below 50% but not less than 40% (≥40%, < 50%) |
| **F** (Fail) | 0 | Below 40% (< 40% ) |
| **Ab** (Absent) | 0 | -- |

A student obtaining F Grade in any Subject shall be considered „failed‟ and will be required to reappear as „Supplementary Candidate‟ in the End Semester Examination (SEE), as and when conducted. In such cases; his Internal Marks (CIE Marks) in those Subject(s) will remain same as those he obtained earlier.

A Letter Grade does not imply any specific % of Marks.

In general, a student shall not be permitted to repeat any Subject/Course (s) only for the sake of „Grade Improvement‟ or „SGPA/CGPA Improvement‟. However, he has to repeat all the Subjects/Courses pertaining to that Semester, when he is detained (as listed in items 8.10).

A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course (excluding Mandatory non-credit Courses). Then the corresponding „Credit Points‟ (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/ Course. **Credit Points (CP) = Grade Point (GP) x Credits For a Course**

The Student passes the Subject/ Course only when he gets GP ≥ 5 (C Grade or above).

## 13. Registration/Dropping

Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the Academic Calendar.

A student at the end of II year II sem either having the CGPA of ≥ 7.0 or having passed all previous courses in first attempt with a minimum CGPA ≥ 5.0 is allowed to register

an additional theory course/credits. However mandatory non credit courses can be registered during the course of study with the consent of the faculty advisor.

A student would be allowed to register in an additional course only if he/she satisfies the prerequisites.

Departments will notify at the time of registration about the minimum number of students to be enrolled for a particular course to be offered.

Any student may be barred from registering for any course for specific reasons like disciplinary reasons, non- payment of fees, etc.

Dropping of Courses: Within four weeks after the commencement of the semester, the student may, in consultation with his / her faculty advisor, drop one or more courses. The dropped courses are not recorded in the Grade Card.

## 14 Earning of Credit

A student shall be considered to have completed a Course successfully and earned the credits if he/she secures an acceptable letter grade in the range „O" to „C". Letter grade 'F' in any Course implies failure of the student in that Course and no credits earned.

## 15 Passing Standards:

A student shall be declared successful or „passed" in a Semester, only when he gets a SGPA ≥ 5.00 (at the end of that particular Semester); and a student shall be declared successful or „passed" in the entire UGP, only when he/she gets a CGPA ≥ 5.00; subject to the condition that he secures a GP ≥ 5 (C Grade or above) in every registered Subject/ Course in each Semester (during the entire UGP) for the Degree Award, as required.
A Student shall be declared successful or „passed" in any Non-Credit Subject/ Course, if he secures a „Satisfactory Participation Certificate" for that Mandatory Course.

After the completion of each Semester, a Grade Card or Grade Sheet (or Transcript) shall be issued to all the Registered Students of that Semester, indicating the Letter Grades and Credits earned. It will show the details of the Courses Registered (Course Code, Title, No. of Credits, Grade Earned etc.), Credits earned, SGPA, and CGPA

## 16 Vertical Progression

It shall also be necessary to lay down uniform minimum standards for SGPA and CGPA together with the minimum number of *credits* to be earned in a semester for the *vertical progression* of students. This shall be used in facilitating the mobility of students from one College to another and also in avoiding any confusion among the students. The

a) Minimum Standard for SGPA =5.0;
b) Minimum Standard for CGPA =5.0; (at the end of each semester)

However, failure to secure a minimum CGPA = 5.0 at the end of any semester for the first time, shall **attract a warning** before approval of the student to continue in the following semester.

## 17 Eligibility for Award of B.Tech. Degree

A student shall be eligible for award of the B.Tech degree if he/she fulfils all the following conditions;

Registered and successfully completed all the components prescribed in the

Programme of study to which he/she is admitted by securing 160 credits.

Obtained CGPA greater than or equal to 5.0 (Minimum requirements for Pass),

Has no dues to the Institute, hostels, Libraries, NCC/NSS etc., and

No disciplinary action is pending against him/her.

## 18 Award of Class

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

A student who qualifies for the award of the degree as listed in item 18.1 shall be placed in the following classes.

Students with final CGPA (at the end of the under graduate programme) ≥ 8.00, and fulfilling the following conditions –

i. Should have passed all the subjects/courses in „first appearance" in regular semester examinations within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.
ii. Should have secured a CGPA ≥ 8.00, at the end of each of the 8 sequential semesters, starting from I year I semester onwards.
iii. Should not have been detained or prevented from writing the end semester examinations in any semester due to shortage of attendance or any other reason, shall be placed in „first class with distinction".

The Students who secure CGPA ≥ 8.00 not fulfilling the above conditions(18.3) shall be awarded „first class"

Students with final CGPA (at the end of the under graduate programme) ≥ 6.50 but < 8.00, shall be placed in „first class".

Students with final CGPA (at the end of the under graduate programme) ≥ 5.50 but < 6.50, shall be placed in „second class".

All other students who qualify for the award of the degree (as per item 18.1), with final CGPA (at the end of the under graduate programme) ≥ 5.00 but < 5.50, shall be placed in „pass class".

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

Students fulfilling the conditions listed under item 18.3 alone will be eligible for award of „college rank" and „gold medal".

The marks obtained in Continuous Internal Evaluation (CIE) and Semester end Examination (SEE) will not be shown in the memorandum of marks.

The CGPA can be converted to equivalent percentage of marks by using the following equation:

**(CGPA - 0.5) X 10**

## 19 Consolidated Grade Card

A consolidated grade card containing credits & grades obtained by the candidates will be issued after completion of the four years B. Tech Programme.

## 20 Withholding of Results

If the student has not paid the dues, if any, to the Institute or if any case of indiscipline is pending against him, the result of the student will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases the matter will be referred to the academic council. The decision of the academic council is final.

## 21 Transitory Regulations

Discontinued, detained, or failed candidates are eligible for readmission as and when next offered as per the college admission procedure.

Students on transfer shall complete the prescribed courses of the concerned programme not covered earlier and however he/she should take the remaining programme along with others.

There shall be no branch transfers after the cut off date of admissions in the academic year.

## 22 Transcripts

After successful completion of the total Programme of study, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee.

## 23 Supplementary Examinations

In addition to the Regular Final Examinations held at the end of each semester, Supplementary Final Examinations will be conducted during the academic year. Candidates taking the Regular / Supplementary examinations as Supplementary candidates may have to take more than one End Semester Examination per day. A student can appear for any number of supplementary examinations till he/she clears all courses which he/she could not clear in the first attempt. However the maximum stipulated period cannot be relaxed under any circumstances.

## 24 Graduation Ceremony

The College shall have its own annual Graduation Ceremony for the award of degree to students completing the prescribed academic requirements in each case, in consultation

with the University and by following the provisions in the Statute.

The College shall institute Prizes and Awards to meritorious students, for being given away annually at the Graduation Ceremony.

## 25 Termination From The Program

The admission of a student to the program may be terminated and the student asked to leave the Institute in the following circumstances:

The student fails to satisfy the requirements of the program within the maximum period stipulated for that program.

The student fails to satisfy the norms of discipline specified by the institute from time to time.

## 26 Non-Credit Courses (Mandatory Courses)

All the courses designated as mandatory course is a compulsory requirement for all students for the award of degree.

These activities carry no credits and are evaluated as Satisfactory/ Unsatisfactory.

Minimum attendance requirement as per the regulations is compulsory for completing the mandatory courses.

## 27 Amendments

The regulations hereunder are subject to amendments as may be made by the Academic Council of the College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already undergoing the program) as may be decided by the Academic Council.

## 28 General

Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

The academic regulation should be read as a whole for the purpose of any interpretation.

In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

## ACADEMIC REGULATIONS FOR B. TECH - LATERAL ENTRY SCHEME (LES)

Applicable for the students admitted into II year B. Tech. (Lateral Entry Scheme) from the Academic Year 2019-20 and onwards

**1. Eligibility for award of B. Tech. Degree (LES)**

The LES candidates shall pursue a course of study for not less than three academic years and not more than six academic years.

The candidate shall register for 122 credits and secure 122 credits by securing a minimum CGPA of 5.0 from II to IV year B.Tech. Program (LES) for the award of B.Tech. degree.

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

The attendance regulations of B. Tech. (Regular) shall be applicable to B.Tech.(LES) scheme.

**2. Promotion Rule**

A student shall be eligible for promotion in B.Tech programme, if he/she acquires the minimum number of credits as given below:

A student shall be promoted from II Year to III Year only if he/she fulfills the academic requirements of securing 60% of average credits (12 credits out of 20 credits) up to II year I semester, from all the examinations, whether or not the candidate takes the examinations.

A student shall be promoted from III year to IV year only if he/she fulfills the academic requirements of securing 60% of average credits (36 credits out of 60 credits) up to III year I semester, from all the examinations, whether or not the candidate takes the examinations.

A student shall register and put up attendance in all 122 credits and earn all 122 credits to be eligible for award of degree.

Students who fail to earn 122 credits as indicated in the course structure within six academic years, shall forfeit their seat in B.Tech. course and their admission stands cancelled.

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

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# ANNEXURE - I

## 1 Grade Point Average

### SGPA and CGPA

The *credit index* can be used further for calculating the Semester Grade Point Average *(SGPA)* and the Cumulative Grade Point Average *(CGPA)*, both of which being important performance indices of the student. While *SGPA* is equal to the *credit index* for a semester divided by the total number of *credits* registered by the student in that semester, *CGPA* gives the sum total of *credit indices* of all the previous semesters divided by the total number of *credits* registered in all these semesters. Thus,

The Grade Point Average (GPA) will be calculated according to the formula:

$$GPA = \frac{\sum CiGi}{\sum Ci}$$

Where Ci = number of credits for the course i,

Gi = grade points obtained by the student in the course.

Semester Grade Point Average (SGPA) is awarded to candidates considering all the courses of the semester. Zero grade points are also included in this computation. SGPA is rounded off to TWO Decimal Places.

**SGPA will be computed as follows**;

$$\frac{\sum [(\text{Course } \textit{credits}) \text{ X } (\textit{Grade points})] \text{ (for all Courses passed in that semester)}}{\sum [(\text{Course } \textit{credits})] \text{ (for all courses in that semester)}}$$

To arrive at Cumulative Grade Point Average (CGPA), the formula is used considering the student‟s performance in all the courses taken in all the semesters completed up to the particular point of time. CGPA is rounded off to TWO Decimal Places.

**CGPA will be computed as follows:**

$$\frac{\sum [(\text{Course } \textit{credits}) \text{ X } (\textit{Grade points})] \text{ (for all Courses passed upto that semester)}}{\sum [(\text{Course } \textit{credits})] \text{ (for all Courses until that semester)}}$$

CGPA is thus computed from the I Year First Semester onwards, at the end of each Semester, as per the above formula. However, the SGPA of I year I Semester itself may be taken as the CGPA, as there are no cumulative effects

**Illustrative Example**

An illustrative example given in below Table below indicates the use of the above two equations in calculating SGPA and CGPA, both of which facilitate the declaration of academic performance of a student, at the end of a semester and at the end of successive semesters respectively . Both of them shall be normally calculated up to the second decimal position, so that the *CGPA*, in particular, can be made use of in rank ordering the student's performance in a class. If two students get the same *CGPA*, the tie should be resolved by considering the number of times a student has obtained higher *SGPA;* But, if it is not resolved even at this stage, the number of times a student has obtained higher grades like O, A, B etc shall be taken into account in rank ordering of the students in a class.

| Year and Semester | Course No. | Credits | Grade | Grade Points | Credit Points |
|---|---|---|---|---|---|
| I Year I sem | XX101 | 5 | A | 8 | 40 |
| I Year I sem | XX102 | 4 | F | 0 | 00 |
| I Year I sem | XX103 | 3 | A+ | 9 | 27 |
| I Year I sem | XX104 | 4 | F | 0 | 00 |
| I Year I sem | XX105 | 5 | C | 5 | 25 |
| I Year I sem | XX106 | 5 | C | 5 | 25 |
| **Total** | | **26 (18*)** | | | **117** |
| **SGPA = 117/26 = 4.5** | | | | **CGPA = 4.5** | |
| I Year II Sem | XX107 | 5 | B+ | 7 | 35 |
| I Year II Sem | XX108 | 4 | A | 8 | 32 |
| I Year II Sem | XX109 | 3 | C | 5 | 15 |
| I Year II Sem | XX110 | 5 | C | 5 | 25 |
| I Year II Sem | XX111 | 4 | A+ | 9 | 36 |
| I Year II Sem | XX112 | 2 | F | 0 | 00 |
| I Year II Sem | Xx113 | 2 | A | 8 | 16 |
| **Total** | | **25 (23*)** | | | **159** |
| **SGPA = 159/25 = 6.36** | | | | **CGPA = 276/51 = 5.41** | |

*Total No. of credits excluding those with 'F'; this is particularly important to keep track of the number of credits earned by a student up to any semester;

## Malpractices Rules

| S.No. | Nature of Malpractices / Improper conduct during examinations | Punishment |
|---|---|---|
| | If the candidate: | |
| 1. (a) | Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination) | Expulsion from the examination hall and cancellation of the performance in that subject only. |
| (b) | Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter. | Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him. |
| 2. | Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The hall ticket of the candidate is to be cancelled. |
| 3. | Impersonates any other candidate in connection with the examination. | The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him. |

| | | |
|---|---|---|
| 4. | Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. |
| 5 | Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass | Cancellation of the performance in that subject. |
| 6 | Refuses to obey the orders of the Chief Superintendent / Assistant Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer – in charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination. | In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them. |
| 7. | Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work & shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. |

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

All cases pertaining to Malpractices in Examinations will be pursued by the Committee Constituted by the Controller of Examination.

# ANURAG GROUP OF INSTITUTIONS
## AUTONOMOUS

**I YEAR I SEMESTER** **COURSE STRUCTURE**

| S. No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | A51001 | Mathematics–I | 3 | 1 | 0 | 4.0 |
| 2 | A51002 | English | 2 | 0 | 0 | 2.0 |
| 3 | A51003 | Engineering Chemistry | 3 | 1 | 0 | 4.0 |
| 4 | A51004 | Programming for Problem Solving - I | 2 | 0 | 0 | 2.0 |
| 5 | A51005 | Engineering Graphics & Design | 1 | 0 | 3 | 2.5 |
| 6 | A51207 | Engineering Chemistry Lab | 0 | 0 | 3 | 1.5 |
| 7 | A51208 | English Language Skills Lab | 0 | 0 | 2 | 1.0 |
| 8 | A51209 | Programming for Problem Solving Lab-I | 0 | 0 | 3 | 1.5 |
| **Total** | | | **11** | **02** | **11** | **18.5** |

**I YEAR II SEMESTER** **COURSE STRUCTURE**

| S.No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | A52001 | Mathematics–II | 3 | 1 | 0 | 4.0 |
| 2 | A52002 | Engineering Physics | 3 | 1 | 0 | 4.0 |
| 3 | A52003 | Programming for Problem Solving –II | 2 | 0 | 0 | 2.0 |
| 4 | A52004 | Engineering Mechanics | 3 | 1 | 0 | 4.0 |
| 5 | A52210 | Engineering Physics Lab | 0 | 0 | 3 | 1.5 |
| 6 | A52211 | Engineering Workshop | 0 | 0 | 3 | 1.5 |
| 7 | A52212 | English Communication skills Lab | 0 | 0 | 2 | 1.0 |
| 8 | A52213 | Programming for Problem Solving Lab-II | 0 | 0 | 3 | 1.5 |
| **Total** | | | **11** | **03** | **11** | **19.5** |

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| I Year B.Tech. MECH- I Sem | L | T/P/D | C |
|---|---|---|---|
| | 3 | 1/-/- | 4 |

## MATHEMATICS-I

### (Linear Algebra and Calculus)

**Course Objectives:** To learn

1. Determine the rank of the matrix and investigate the solution of system of equations by applying the concepts of consistency.
2. Concepts of Eigen values and Eigen vectors and the nature of quadratic form by finding Eigen values.
3. Concepts of sequence and series and identifying their nature by applying some tests.
4. Mean value theorems geometrical interpretation and their application to the mathematical problems, Evaluation of improper integrals using Beta and Gamma functions
5. Partial differentiation, Total derivative and finding maxima minima of functions of several variables.

**Course Outcomes:** After learning the contents of this paper the students must able to:

1. Write the matrix representation of system of linear equations and identify the consistency of the system of equations.
2. Find the Eigen values and Eigen vectors of the matrix and discuss the nature of the quadratic form.
3. Analyze the convergence of sequence and series.
4. Discuss the applications of mean value theorems to the mathematical problems, Evaluation of improper integrals using Beta and Gamma functions.
5. Examine the extrima of functions of two variables with/ without constraints.

**UNIT-I: Matrices and Linear System of Equations**

Matrices and Linear systems of equations: Real matrices – Symmetric, skew - symmetric, orthogonal, Linear Transformation – Orthogonal Transformation. Complex matrices: Hermitian, Skew – Hermitian and Unitary. Elementary row transformations-Rank-Echelon form, Normal form – Solution of Linear Systems – Direct Methods (Gauss Jordan).

**UNIT-II: Eigen Values and Eigen Vectors**

Eigen values, Eigen vectors – properties, Cayley-Hamilton Theorem (without Proof) - Inverse and powers of a matrix by Cayley-Hamilton theorem – Diagonolization of matrix- Quadratic forms: Nature, Index, Signature.

**UNIT-III: Sequences & Series**

Sequence: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences.

Series: Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, p-test, D-Alembert‟s ratio test; Cauchy‟s root test; Raabe‟s test; Cauchy‟s Integral test; logarithmic test. Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.

**UNIT-IV: Beta & Gamma Functions and Calculus**

Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (only in Cartesian coordinates). Improper Integrals and their properties, Gamma and Beta Functions-Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions.

Rolle‟s Theorem, Lagrange‟s mean value theorem, Cauchy‟s mean value theorem, Generalized Mean Value theorem (all theorems without proof) – Geometrical interpretation of Mean value theorems.

**UNIT-V: Multi Variable Calculus ( Partial Differentiation and applications)**

Partial Differentiation and total differentiation, Functional dependence, Jacobian Determinant-Maxima and Minima of functions of two variables with constraints and without constraints, Method of Lagrange Multipliers.

**TEXTBOOKS:**


1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010


**REFERENCES:**


1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
3. Bernard Kolman and David R. Hill Introductory Linear Algebra: An Applied First Course, 8th Edition, Pearson.

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| **I Year B.Tech. MECH- I Sem** | **L** | **T/P/D** | **C** |
|---|---|---|---|
| | 2 | 0/0/0 | 2 |

# ENGLISH

### Course Objectives:

The course will help to

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
3. Develop study skills and communication skills in formal and informal situations.

### Course Outcomes:

The students will be able to

1. Understand the application of language skills in promoting the responsibilities towards society.
2. Use appropriate and Standard Language with basic grammatical concepts both for Technical and Professional purpose.
3. Use General and Technical Vocabulary in different academic situations.
4. Apply the Subject and Theme in establishing and spreading Human Values in the society.
5. Compose different kinds of Writing: Formal Letters, Précis Writing, Essay Writing and Technical Report Writing.

**UNIT –I**

**'The Raman Effect'** from the prescribed textbook **'English for Engineers'** published by **Cambridge University Press**.

**Vocabulary Building**: The Concept of Word Formation --The use of Prefixes and Suffixes.

**Grammar:** Identifying Common Errors in Writing with reference to Articles and Prepositions.

**Reading:** Reading and its Importance- Techniques for Effective Reading.

**Basic Writing Skills:** Sentence Structures –Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for writing precisely –

**Paragraph writing** – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

**UNIT –II**

**'Ancient Architecture in India'** from the prescribed textbook **'English for Engineers'** published by **Cambridge University Press.**

**Vocabulary:** Synonyms and Antonyms.

**Grammar:** Identifying Common Errors in Writing with Reference to Noun-Pronoun Agreement and Subject-Verb Agreement.

**Reading:** Improving Comprehension Skills – Techniques for Good Comprehension

**Writing:** Format of a Formal Letter- Writing Formal Letters Eg. Letter of Complaint, Letter of Requisition.

**UNIT –III**

**'Blue Jeans'** from the prescribed textbook „**English for Engineers'** published by **Cambridge University Press.**

**Vocabulary:** Acquaintance with Prefixes and Suffixes from foreign languages in English to form Derivatives-Words from foreign languages and their use in English.

**Grammar:** Identifying Common Errors in writing with reference to Misplaced Modifiers and Tenses.

**Reading**: Sub-skills of Reading- Skimming and Scanning

**Writing:** Nature and Style of Sensible Writing- Defining- Describing Objects, Places and Events – Classifying- Providing Examples or Evidence

**UNIT –IV**

**'What Should You Be Eating'** from the prescribed textbook „**English for Engineers'** published by **Cambridge University Press.**

**Vocabulary**: Standard Abbreviations in English

**Grammar:** Redundancies and Clichés in oral and written communication.

**Reading**: Intensive Reading and Extensive Reading

**Writing: Writing Practices**--Writing Introduction and Conclusion - Essay Writing- Précis Writing.

**UNIT –V**

**'How a Chinese Billionaire Built Her Fortune'** from the prescribed textbook **'English for Engineers'** published by **Cambridge University Press**.

**Vocabulary**: Technical Vocabulary and its usage

**Grammar:** Common Errors in English

**Reading:** Reading Comprehension-exercises for practice

**Writing: Technical Reports**- Introduction – characteristics of a Report – categories of Report Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

***Text book:***


1. Sudarshana, N.P. and Savitha, C. (2018). *English for Engineers.* Cambridge University Press.


**References:**


1. Green, David. *Contemporary English Grammar –Structures and Composition.* MacMillan India. 2014 (Print)
2. Rizvi, M. Ashraf. *Effective Technical Communication*. Tata Mc Graw –Hill. 2015 (Print)
3. Raman, Meenakshi and Sharma, Sangeeta. *"Technical Communication- Principles and Practice".* Third Edition. New Delhi: Oxford University Press. 2015. Print.
4. *Practical English Usage.* Michael Swan. OUP. 1995.
5. *Remedial English Grammar.* F.T. Wood. Macmillan.2007
6. *On Writing Well.* William Zinsser. Harper Resource Book. 2001
7. *Study Writing.* Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
8. *Communication Skills*. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
9. *Exercises in Spoken English.* Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

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| **I Year B.Tech. MECH- I Sem** | **L** | **T/P/D** | **C** |
|---|---|---|---|
| | **3** | **1/0/0** | **4** |

# Engineering Chemistry

**Course Objectives:**

1. To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
2. To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
3. To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and in industry.
4. To acquire the skills pertaining to spectroscopy and to apply them for medical and other fields.
5. To impart the knowledge of stereochemistry and synthetic aspects useful for understanding reaction pathways

**Course Outcomes:**
**The course will enable the student to:**

1. Apply the knowledge of atomic, molecular and electronic changes with spectroscopy.
2. Analyze the troubles caused by impure water and method of purification of water.
3. Apply the knowledge of electrode potentials for the protection of metals from corrosion.
4. Explain the concept of configurational and conformational analysis of molecules and reaction mechanism.
5. Analyze the characteristics, properties and uses of engineering materials.

**UNIT I:**

## Molecular structure and Spectroscopy (9L)

Introduction, Concept of atomic and molecular orbitals, LCAO, Molecular orbitals of diatomic molecules, Molecular orbital energy level diagrams of diatomic molecules($N_2$, $O_2$ and $F_2$). Pi-molecular orbitals of butadiene and benzene.

### Spectroscopic techniques:

Principles of spectroscopy, selection rules and applications of Electronic spectroscopy (UV & Visible).
Vibrational and rotational spectroscopy(IR spectroscopy) - Applications.

## UNIT II: Water Technology (9L)

Hardness of water, expression of hardness ($CaCO_3$ equivalent), units and types of hardness. Estimation of temporary and permanent hardness of water by EDTA method. Numerical problems based on hardness of water. Potable water: characteristics, treatment of water for domestic supply. Desalination of brackish water: reverse osmosis. Alkalinity of water and its determination. Boiler feed water: Boiler troubles(scale and sludge,priming ,foaming, caustic embrittlrment and boiler corrosion)and its treatment: Internal treatment (colloidal, phosphate calgon conditioning of water). External treatment (ion –exchange process).

**UNIT III:**

## Electrochemistry and corrosion (12L)

Electrode, electrode potential, galvanic cell, cell reactions and cell notation, cell EMF, types of electrodes (Normal Hydrogen Electrode, calomel electrode) , Determination of pH. Nernst equation, Numerical problems.

**BATTERIES:** Introduction to cell and battery, Primary (lithium cell) and secondary cells, (lead-Acid cell, and Lithium ion cells). Fuel cells – Hydrogen – Oxygen fuel cell, advantages and engineering applications of fuel cells.

**Corrosion:** Introduction, types of corrosion: chemical and electrochemical corrosion, factors affecting the rate of corrosion : nature of the metal , galvanic series, purity of metal, nature of corrosion product , nature of environment : effect of temperature, effect of pH, humidity. Corrosion control methods: Cathodic protection: sacrificial anode method and impressed current cathode method. Protective coatings : metallic coatings (anodic and cathodic), methods of applications of metallic coatings: Galvanisation, electroplating(of copper ), electroless plating (of Ni) .

**UNIT IV:**

## Stereochemistry, Reaction mechanism and synthesis of drug molecules (9L)

Structural isomers and stereoisomers, configurations, symmetry and chirality, enantiomers, diastereomers, optical activity. Conformational analysis of n-butane.

Introduction to reactions involving substitution(SN1 & SN2), addition(addition of HBr to propene, Markownikoff and Anti Markownikoff addition), Elimination reactions: dehydro halogination of alkyl halides. Saytzeff rule. oxidation(oxidation of alcoholsusing $KMnO_4$ & $CrO_3$), reduction(reduction of carbonyl compounds by $LiAlH_4$ & $NaBH_4$). Synthesis & uses of commonly used drug molecules: paracetamol and Asprin.

**UNIT V:**

**Advanced Engineering Materials(9L)**

**Biodegradable polymers:**

Introduction, Preperation and properties of Polyhydroxy butyrate (PHB),Poly-Hydroxybutyrate-co-b-Hydroxy valerate (PHBV) ,Polyglycolic acid (PGA) , Polylactic acid (PLA) ,Poly (Î-caprolactone) (PCL). Applications of biodegradable polymers.

**Lubricants:** Classification and properties of lubricants: Viscosity and viscosity index, cloud point, pour point, flash & fire point.

**Refractories**: Classification, Properties of refractory materials.( Refractoriness, RUL test & Thermal spalling,). Characteristics of a good refractory.

**Text Books:**


1. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpat Rai Publishing Company.
2. Text book of Engineering Chemistry by A. Jayashree, Wiley Publications.


**Reference Books:**


1) Physical Chemistry, by P. W. Atkins
2) Engineering Chemistry by Shashi chawla, Dhanpat Rai Publishing Company.

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| I Year B.Tech. MECH- I Sem | L | T/P/D | C |
|---|---|---|---|
| | 2 | 0/0/0 | 2 |

### PROGRAMMING AND PROBLEM SOLVING-I

**Course Outcomes:** At the end of this course, the student would be able to

1. Design algorithms and flowcharts for real world applications using „C"
2. Know the usage of various operators in Program development
3. Design programs involving decision and iteration structures.
4. Apply the concepts code reusability using Functions
5. Analyze various searching and solving techniques using Arrays

**UNIT - I**

**Problem Solving Using Computers:** Introduction, Algorithms, Flowcharts and Pseudocode.
**Overview of C Language:**Introduction, Salient Features of C Language, Structure of a "C" Program.
**C Language Preliminaries:** Keywords and Identifiers, Constants, Variables, Data Types, and Input Output Statements with suitable illustrative "C" Programs.

**UNIT-II**

**Operators**: Assignment Operators, Relational and Logical Operators, Increment and Decrement Operators, Bitwise Operators,Ternary Operator, Type Conversion, Precedence and Associativity with suitable illustrative "C" Programs.

**UNIT-III**

**Statements in C:**
**Conditional/Decision Statements**: if, if-else, Nested if-else, else-if ladder, and Switch-Statement with suitable illustrative "C" Programs.
**Loop Control Statements**: while, do-while and for with suitable illustrative "C" Programs.

**UNIT-1V**

**Functions**: Introduction to Functions, benefits of functions, types of functions, Function calls, return vsexit( ),Parameter Passing mechanisms, Call-by-Value, Recursion, Storage Classes

**UNIT-V**

**Arrays:** Introduction to Arrays, One-Dimensional Arrays, Two-Dimensional Arrays, Arrays and Functions
**Strings:** Introduction to Strings, String I/O, String Operations with and without built-in functions
(strlen( ), strcmp( ), strcat( ),strcpy( ), and strrev( ))

**Text Books:**


1. B.A.Forouzon and R.F. Gilberg, “COMPUTER SCIENCE: A Structured Programming Approach Using C”, Third edition, CENGAGE Learning, 2016
2. Pradip Dey and Manas Ghosh, Programming in C, Oxford University Press, 2nd Edition 2011.


**Reference Books:**


1. Byron Gottfried, “Programming with C “, Schaum‟s Outlines, 2nd Edition, TATA McGraw-Hill.
2. M.T.Somashekara, “Problem Solving Using C”, PHI, 2nd Edition 2009.
3. A.K.Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press
4. Rajaraman V., "The Fundamentals of Computers", 4th Edition,Prentice Hall of India, 2006.
5. R S Bichker, "Programming in C", University Press, 2012.

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## AUTONOMOUS

| I Year B.Tech. MECH- I Sem | L | T/P/D | C |
|---|---|---|---|
| | 1 | 0/0/4 | 3 |

## Engineering Graphics & Design

**Pre-requisites: Nil**

**Course objectives:**

1. To provide basic concepts in engineering drawing.
2. To impart knowledge about standard principles of orthographic projection of objects.
3. To draw sectional views and development of surfaces of solids.
4. To draw Isometric views and its projections.
5. To prepare you to use the techniques, skills, and modern engineering tools like Auto Cad software necessary for engineering practice

**Course Outcomes:**

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

1. Understand engineering drawing and its place in society.
2. Visualize the different aspects of Points, Lines and Planes.
3. Acquire knowledge on projections of solids.
4. Draw sections of solids and plan the drawing for development of surfaces.
5. Understand the isometric views and projections. Exposure to computer-aided geometric design and creating working drawings.

**UNIT-1 Introduction to Engineering Drawing -** Principles of Engineering Graphics and their significance, usage of Drawing instruments, Conic sections including the Rectangular Hyperbola-General method only, Cycloid, Epicycloids and Hypocycloid.

**UNIT-2 Orthographic Projections -** Principles of Orthographic Projections-Conventions-Projections of Points and Projections of lines (Midpoint problems and Traces are not included). Projections of Plane (regular geometry figures).

**UNIT-3 Projections of Regular Solids -** Prism, Cylinder, Pyramid, Cone, Sectional Views of Right Regular Solids-Prism, Cylinder, Pyramid, Cone – Auxiliary Views;

**UNIT-4 Development of Surfaces of Right Regular Solids -** Prism, Pyramid, Cylinder and Cone, Intersections of Prism vs Prism and Cylinder vs Cylinder.

**UNIT-5 Isometric Projections -** Principles of Isometric Projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of Lines, Plane figures, Simple and Compound Solids. Conversion of Isometric Views to Orthographic Views and Vice-versa.

**Introduction to CAD (For Internal Evaluation Weightage Only)**

Introduction to Auto Cad software package commands, drawing 2D and 3D sketches for simple objects by using Auto Cad software package.

**Text Books:**


1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
3. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
4. Computer Aided Engineering Drawing – K Balaveera Reddy – CBS Publishers.


**Reference Books:**


1. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education.
2. Engineering Drawing by K.VenuGopal , V.Prabhu Raja, New Age Publications.
3. Corresponding set of CAD Software Theory and User Manuals.

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| I Year B.Tech. MECH- I Sem | L | T/P/D | C |
|---|---|---|---|
| | 0 | 0/2/0 | 1 |

## English Language Skills Lab

**Course Objectives:**

The students will be able to

1. Facilitate computer-assisted multi-media instruction enabling individualized and independent language learning.
2. Sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm.
3. Bring about a consistent accent and intelligibility in students‟ pronunciation of English by providing an opportunity for practice in speaking.
4. Improve the fluency of students in spoken English and neutralize their mother tongue influence.
5. Train the students to use language appropriately for public speaking, group discussions and interviews.

**Course Outcomes**

The students will be able to

1. Understand the importance of speech sounds and Listening Comprehension.
2. Understand syllables and Consonant Clusters.
3. Speak with appropriate Word Accent and Intonation.
4. Learn to communicate effectively at work place with a special focus on social and professional etiquette.
5. Learn Task Based Language Learning (TBLL) through various language activities effectively.

English Language Communication Skills Lab (ELCS) shall have two parts:

- Computer Assisted Language Learning (CALL) Lab
- Interactive Communication Skills (ICS) Lab

**Exercise-I**

**CALL Lab**:

Introduction to Phonetics - Speech Sounds

Vowels and Consonants-Listening Comprehension

**ICS Lab**:

Ice-Breaking activity and JAM session

**Exercise-II**

**CALL Lab:**

Pronunciation, Common Errors in Pronunciation, Neutralization of Mother Tongue Influence

**ICS Lab:**

Common Everyday Situations: Conversations and Dialogues

**Exercise-III**

**CALL Lab**:

Syllables -Consonant Clusters

**ICS Lab:**

Communication at Workplace, Social and Professional Etiquette

**Exercise-IV**

**CALL Lab**:

Intonation, Stress and Rhythm

**ICS Lab:**

Formal Presentations, Visual Aids in Presentations

**Exercise-V**

**CALL Lab:**

Word accent and Stress Shifts

**ICS Lab:**

Interview Skills

**Text Books :**


1. Suresh Kumar, E. & Sreehari, P. 2009. A Handbook for English Language Laboratories. New Delhi: Foundation
2. Speaking English Effectively 2nd Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
3. Sasi Kumar, V & Dhamija, P.V. How to Prepare for Group Discussion and Interviews. Tata McGraw Hill
4. Hancock, M. 2009. English Pronunciation in Use. Intermediate. Cambridge: CUP
5. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Blackswan. Hyderabad.
6. Hewings, M. 2009. English Pronunciation in Use. Advanced. Cambridge: CUP
7. Marks, J. 2009. English Pronunciation in Use. Elementary. Cambridge: CUP
8. **A textbook of English Phonetics for Indian Students** by T. Balasubramanian (Macmillan)
9. **Lab Manual:** A Manual entitled "**English Language Communication Skills (ELCS) Lab Manual- cum- Work Book**", published by Cengage Learning India Pvt. Ltd, New Delhi. 2013

## ANURAG GROUP OF INSTITUTIONS
**AUTONOMOUS**

| **I Year B.Tech. MECH- I Sem** | **L** | **T/P/D** | **C** |
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# Engineering Chemistry Lab

**Course Objectives:** The student will learn:

1. Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
2. To determine the rate constant of reactions from concentrations as a function of time.
3. The measurement of physical properties like adsorption and viscosity.
4. To synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic (TLC) technique.

**Laboratory Outcomes:** The experiments will make the student gain skills on:

1. Determination of parameters like hardness, alkalinity and chloride content in water.
2. Estimation of rate constant of a reaction from concentration – time relationships.
3. Determination of physical properties like adsorption, surface tention and viscosity.
4. Calculation of strength of compound using instrumentation techniques.

**Choice of 10-12 experiments from the following:**

1. Estimation of hardness of water by EDTA method
2. Determination of alkalinity of water
3. Determination of chloride content of water
4. Determination of strength of HCl by conductometry.
5. Potentiometry - determination of $Fe^{+2}$ by using $KMnO_4$.
6. Determination of surface tension
7. Determination of viscosity of a lubricant
8. Determination of the rate constant of a reaction
9. Synthesis of a polymer/drug
10. Estimation of copper by colorimetry
11. Adsorption of acetic acid by charcoal
12. Thin layer chromatography
13. Saponification/acid value of an oil

**TEXT BOOKS:**


1. Vogel's Textbook of Quantitative Chemical Analysis
2. Essentials of experimental engineering chemistry , Shashi Chawla, Dhanpat Rai & Co


**REFERENCE BOOKS:**


1. Text Book of engineering chemistry by R. N. Goyal and Harrmendra Goel.
2. A text book on experiments and calculations . S.S. Dara.

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### PROGRAMMING AND PROBLEM SOLVING LAB – I

**Course Outcomes:** At the end of this course, the student would be able to

1 Apply the specification of syntax rules for numerical constants and variables, data types

2 Know the Usage of various operators and other C constructs

3 Design programs on decision and control constructs

4 Develop programs on code reusability using functions

5 Implement various searching and sorting algorithms using arrays

**Week 1:**

Ubuntu and Linux Commands

**Week 2:**

Designing of flowcharts and algorithms using raptor tool

1. Areas of Polygons
2. Calculation of Simple and Compound Interest
3. Swapping of Two numbers with and without temporary variable
4. Checking whether a number is even or odd
5. Sum of first „n‟ natural numbers
6. Checking a number whether it is divisible by any given number
7. Evaluation of mathematical expressions.
8. Programs using scanf( ) and printf( ) statements.

**Week 3:**

Programs on operators

**Week 4,5&6:**

Programs Conditional Statements

**Week 7-9:**

Programs on Control Statements

**Week 10&11:**

Programs on Functions

**Week 12:**

Programs on One Dimensional Arrays

**Week 13:**

Programs on Two Dimensional Arrays

**Week 14:**

Implementation of Linear Search and Binary Search

**Week 15:**

Implementation of Bubble Sort and Insertion Sort

**Week 16:**

Review

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## MATHEMATICS-II

**(Ordinary Differential Equations and Vector Calculus)**

**Course Objectives:** To learn

1. Methods of solving the differential equations of first and higher orders.
2. The physical quantities involved in engineering field related to vector valued functions.
3. Evaluation of multiple integrals and their applications.
4. The basic properties of vector valued functions and their applications to line, surface and volume integrals.

**Course Outcomes:** After learning the contents of this paper the students must be able to:

1. Classify the various types of differential equations of first order and first degree and apply the concepts of differential equations to the real world problems.
2. Solve higher order differential equations and apply the concepts of differential equations to the real world problems.
3. Evaluate the multiple integrals and apply the concept to find area and volume.
4. Identify the vector differential operators physically in engineering problems.
5. Evaluate the line, surface and volume integrals and converting them from one to another by using vector integral theorems.

**UNIT-I: Differential Equations of first order and their Applications**

Formation of a Differential equations, Differential equations of first order and first degree: exact, linear and Bernoulli, Applications to Newton‟s law of cooling, law of natural growth and decay, orthogonal trajectories.

**UNIT-II: Higher Order Linear Differential Equations**

Linear differential equations of second and higher order with constant coefficients, RHS term of the type $f(X) = e^{ax}, \sin ax, \cos ax \text{ and } x^k, e^{ax}V(x), x^kV(x)$. Method of variation of parameters. Equations reducible to linear ODE with constant coefficients: Legendre‟s equation, Cauchy-Euler equation.

**UNIT-IV: Multiple Integrals**

Multiple integrals - double and triple integrals – change of order of integration (Only Cartesian form)- change of variables (Cartesian to Polar for double integral, Cartesian to Spherical for triple integral). Applications of Double integrals and Triple integrals.

**UNIT-IV: Vector Differentiation**

Vector point function and scalar point function. Gradient- Divergence- Curl and their related properties – Directional derivatives. Vector Identities, Scalar potential function, Solenoidal and Irrotational vectors.

**UNIT-V: Vector Integration**

Line integral, work done, Surface and Volume integrals. Vector integrals theorems: Green‟s, Stoke‟s and Gauss Divergence Theorems (Only Statements & their Verifications).

**TEXTBOOKS:**


1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley &Sons, 2006.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010


**REFERENCES:**


1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
3. Dennis G Zill and Michael R Cullen, Advanced Engineering Mathematics 3rd Edition, Jones & Bartlett Learning, 2006 - Technology & Engineering.

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## ENGINEERING PHYSICS

**Course Outcomes:** After completion of this course the student is able to

1. Understand basics of mechanical and electrical oscillators.
2. Learn the importance of interference pattern in thin films, diffraction and resolution.
3. Distinguish principle, working of various laser systems and light propagation through optical fibers.
4. Examine various crystal systems and crystal structures through X-RD.
5. Learn various magnetic and dielectric properties of materials for engineering applications.

**UNIT-I Oscillations and Waves ( 9 hours + 3 T)**

Simple harmonic motion, Equation of simple harmonic motion, Simple pendulum, Torsional pendulum, Damped harmonic oscillations, Wave equation for damped harmonic motion-heavy, Critical and light damping, Energy decay in a damped harmonic oscillator, Power dissipation, Quality factor, Forced oscillations, Equation of motion of forced vibrations, Resonance, Electrical analogy for a simple harmonic oscillator.

Waves; Equation of motion of transverse wave, Reflection and Transmission at a boundary, Stationary waves, Numerical Problems.

**UNIT-II Wave Optics (9 hours + 3 T)**

Huygen‟s principle, Superposition of waves, Coherence and methods to produce coherent sources, Young‟s double slit experiment, Interference in thin film by reflection, Newton‟s rings, Diffraction: Difference between Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction at single slit, Plane diffraction Gratings and their resolving power.

Polarization: Introduction, Polarization by reflection, Polarization by double refraction, Numerical Problems.

**UNIT-III Fiber Optics and Lasers (9 hours + 3 T)**

**Fiber Optics:** Introduction, Total internal reflection, Acceptance angle and numerical aperture, Losses associated with optical fibers, Step and graded index fibers, Applications of optical fibers, Numerical Problems.

**Lasers**: Introduction to interaction of radiation with matter: stimulated absorption, spontaneous emission and stimulated emission, Characteristics of a laser, Einstein‟s coefficients, Important components of a laser: active medium, pumping source, optical resonator, Population inversion, Ruby laser, He-Ne laser, Semiconductor laser, Applications of lasers, Numerical Problems.

**Unit-IV Crystal Structures, Crystal Planes and X-RD (8 hours + 2 T)**

Space lattice, Unit cell, Lattice parameters, Crystal systems, Bravais lattices, Co-ordination number, Atomic packing fraction, Structures and Packing fractions of Simple Cubic, Body Centered Cubic, Face Centered Cubic crystals.

Crystal planes and Directions, Miller Indices for Crystal planes, Inter planar spacing of orthogonal crystal systems, Diffraction of X-rays by crystal planes: Bragg‟s law, Powder method, Applications of X-ray diffraction, Numerical Problems.

**UNIT-V Dielectric and Magnetic Properties of Materials (11 hours + 3 T)**

**Magnetic Properties**: Basic definitions, Origin of magnetic moment, Bohr magneton, Classification of Dia, Para and Ferro magnetic materials, Domain theory of ferromagnetism, Hysteresis curve, Soft and Hard magnetic materials, Properties of Anti -Ferro and Ferri magnetic materials, Applications Numerical Problems.

**Dielectric Properties**: Dielectric polarization, Permeability and dielectric constant, Polar and non-polar dielectrics, Electronic, Ionic and Orientation Polarizations and calculation of Polarizabilities, Internal fields, Clausius – Mossotti equation, Basic concepts of Piezo and Ferro electricity, Applications of dielectrics, Numerical Problems.

**Text books:**


i. A Text book of Engineering Physics by M N Avadhanulu, P G Kshirsagar; S Chand.

ii. Engineering Physics by B K Pandey and S Chaturvedi; CENGAGE Learning.

iii. Engineering Physics by D K Bhattacharya and PoonamTandon; OXFORD University Press.


**Reference books:**


i. Ian G. Main, Oscillations and waves in physics

ii. H.J. Pain, The physics of vibrations and waves

iii. A. Ghatak, Optics

iv. O. Svelto, Principles of Lasers

v. Engineering Physics by P K palanisamy :Scietech publication

vi. Introduction to Solid State Physics by Charles Kittel : John Wiley & Sons

vii. Solid State Physics by M Armugam; Anuradha Publications

viii. Solid state Physics by Puri and Bubber

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**PROGRAMMING AND PROBLEM SOLVING-II**

**Course Outcomes:** At the end of this course, the student would be able to

1) Identify various string handling functions in„C"
2) Develop programs with user defined data types.
3) Use dynamic memory allocation functions with pointers.
4) Distinguish between stacks and queues.
5) Analyze various dynamic data structures.

**UNIT -I**

**Structures:** Definition and Initialization of Structures, Accessing structure members,Nested Structures, Array of Structures, Structures and Functions, Unions, typedef, Enumerated Data types.

**UNIT-II**

**Pointers:** Introduction to Pointers, Pointer Arithmetic, Pointers and Arrays, Pointers to Structures, Pointers and Strings, Function - Call by Reference, Pointers to Pointers, Dynamic Memory Allocation.

**UNIT III:**

Files: Introduction to Files, working with text File, binary File, File organization methods.

**UNIT-IV:**

**Introduction to Data Structures:**Lists and Operations, Linear and Non linear Data structures

**Stacks-**Introduction to Stacks, Operations , Implementation of Stack using Arrays

**Queues-** Introduction to Queues, Operations, Implementation of Queues using Arrays

**UNIT-V**

Linked Lists:Introduction to Linked List, Operations on Single Linked List(search, Insertion &Deletion)Searching and Sorting: Linear Search, Binary Search, Bubble Sort, Insertion Sort.

**Text Books:**


1. B.A.Forouzon and R.F. Gilberg, "COMPUTER SCIENCE: A Structured Programming Approach Using C", Third edition, CENGAGE Learning, 2016
2. PradipDey and Manas Ghosh, Programming in C, Oxford University Press, 2nd Edition 2011.

**Reference Books:**


1. Byron Gottfried, “Programming with C “, Schaum‟s Outlines, 2nd Edition, TATA McGraw-Hill.
2. M.T.Somashekara, “Problem Solving Using C”, PHI, 2nd Edition 2009.
3. A.K.Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press
4. Rajaraman V., "The Fundamentals of Computers", 4th Edition,Prentice Hall of India, 2006.
5. R S Bichker, "Programming in C", University Press, 2012.

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| I Year B.Tech. MECH- II Sem | L | T/P/D | C |
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**ENGINEERING MECHANICS**

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

1. Solve the resultant of forces which are acting on the systems and also able to apply the equilibrium conditions on a body.
2. Solve the problems based on friction.
3. Calculate the centroid and centre of gravity of composite sections.
4. Solve the area and mass moment of inertia of simple and composite sections.
5. Calculate the distance travelled and time required for the particle in case of connected systems.

**UNIT - I:**

**Introduction to Engineering Mechanics:**Basic concepts.
**System of Forces:** Coplanar, Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System.
**Equilibrium of System of Forces:** Free body diagrams, Equations of Equilibrium of Coplanar Systems, Lame‟s Theorem.

**UNIT – II:**

**Friction*:*** Basic concepts, Types of Friction, Laws of Friction, Static and Dynamic Friction, Motion of Bodies, Wedge friction, ladder Friction, screw friction, applications.

**UNIT - III:**

**Centroid:** Centroids of simple figures (from basic principles) Centroids of Composite Figures.
**Centre of Gravity:** CG of simple bodies (from basic principles), CG of composite bodies, Pappus theorem.

**UNIT- IV:**

**Area Moment of Inertia:** Definition - Polar Moment of Inertia, Transfer Theorem, MI of Composite Figures, Product of Inertia, Transfer Formula for Product of Inertia.
**Mass Moment of Inertia:** MI of Masses, Transfer Formula for MMI, MMI of composite bodies.

**UNIT - V:**

**Work – Energy Method:** Equations for Translation, Work-Energy Applications to Particle Motion. Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

**TEXT BOOKS:**


1) Singer‟s Engineering Mechanics by K. Vijaya Kumar Reddy and J. Suresh Kumar.
2) Engineering Mechanics by S.S.Bhavikatti, J.G.Rajasekharappa.
3) Engineering Mechanics by Timoshenko & Young.


**REFERENCE BOOKS:**


1) Engineering Mechanics by Meriam and Kraize
2) Engineering Mechanics by K.L.Kumar / Tata McGraw Hill.
3) Engineering Mechanics by A. K. Tayal.

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| I Year B.Tech. MECH- II Sem | L | T/P/D | C |
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## ENGINEERING PHYSICS LAB

**Course Outcomes:**

Learn principles of interference, diffraction and dispersion of light

1. Realize the importance of I-V characteristics of P-N diode, LED, LASER and solar cell.
2. Know the basic principles of optical fiber and laser.
3. Learn electrical, mechanical and magnetic properties of materials.
4. Learn the mechanical waves undergo interference phenomena.

**List of Experiments:**

1. Determination of Rigidity Modulus of a Material – Torsional Pendulum
2. Study of Resonance in LCR – Series circuit
3. Determination of Time Constant of RC Circuit
4. Determination of frequency of vibrating tuning fork - Melde‟s Experiment
5. Dispersive Power of the Material of a Prism – Spectrometer
6. Newton‟s Rings – Determination of Radius of Curvature of Lens
7. Diffraction Grating – Determination of Wavelength of a Monochromatic Source
8. Single Slit Diffraction using Lasers – Determination of Slit Width
9. Evaluation of Numerical Aperture & Bending losses of an Optical Fiber
10. Stewart & Gees Method – Magnetic field along the axis of a Coil
11. Measurement of Dielectric constant
12. Seebeck Effect-Determination of Seebeck coefficient

**Note: Any 10 experiments are to be performed.**

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| I Year B.Tech. MECH- II Sem | L | T/P/D | C |
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### PROGRAMMING AND PROBLEM SOLVING LAB – II

**Course Outcomes:** At the end of this course, the student would be able to

1 Build programs on various string handling functions

2 Develop applications on user defined data types

3 Apply dynamic memory allocation through pointers

**4** Implement linear data structures through stacks and queues

5 Create linked list dynamically through stacks and queues

**Week 1**

Overview of Arrays and Functions

**Week 2& 3**

Programs on Strings with and without string built-in Functions

**Week 4:**

Programs on Accessing Structures, and Nested Structures

**Week 5&6:**

Array of Structures, Structures and Functions, Pointers to Structures

**Week 7:**

Unions, typedef and enum

**Week 8:**

Programs on pointers with its implementation, pointer arithmetic, pointer expression and Single Dimensional and Two dimensional array programs.

**Week 9:**

Pinter to structures, Programs on Call by Value and Reference, Pointers to Pointers

**Week 10:**

Programs on Dynamic Memory Allocation Functions.

**Week 11:**

Programs on Stacks and Queues Using Arrays

**Week 12& 13:**

Single Linked List Programs

**Week 14&15:**

Programs on File Operations

**Week 16:**

Review

# ANURAG GROUP OF INSTITUTIONS
## AUTONOMOUS

| I Year B.Tech. MECH- II Sem | L | T/P/D | C |
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## Engineering Workshop

**Pre-requisites: Practical skill**

**Course Objectives:**

To Study of different hand operated power tools, uses and their demonstration.

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

**COURSE OUTCOMES:**

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

1. Practice on manufacturing of components using workshop trades including Carpentry, Fitting, Tin-Smithy, Foundry, Welding Practice, House wiring and Black Smithy.
2. Apply basic electrical engineering knowledge for house wiring practice.
3. Identify and apply suitable tools for different trades of Engineering processes including Material removing, Measuring And Chiseling.
4. Study and practice on Plumbing, Machine tools, Power tools, Wood working, Plastic Moulding and their operations

**1. TRADES FOR EXERCISES: At least two exercises from each trade:**

I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)

II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)

III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)

IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)

V. Welding Practice – (Arc Welding & Gas Welding)

VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)

VII. Black Smithy – (Round to Square, Fan Hook and S-Hook)

VIII. Glass Cutting.

**2. TRADES FOR DEMONSTRATION & EXPOSURE:**

Plumbing, Machine Shop, Power tools used in Construction and Wood Working and Plastic Molding

**Suggested Text/Reference Books:**


1) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2) Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3) Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I" Pearson Education, 2008.
4) Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
5) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

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**AUTONOMOUS**

| **I Year B.Tech. MECH- II Sem** | **L** | **T/P/D** | **C** |
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## English Communication Skills Lab

**Course Objectives:**

The students will be able to

1. Facilitate computer-assisted multi-media instruction enabling individualized and independent language learning.
2. Sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm.
3. Bring about a consistent accent and intelligibility in students‟ pronunciation of English by providing an opportunity for practice in speaking.
4. Improve the fluency of students in spoken English and neutralize their mother tongue influence.
5. Train students to use language appropriately for public speaking, group discussions and Interviews.

**Course Outcomes**

The students will be able to

1. Understand the variants in Pronunciation.
2. Differentiate Spoken and Written English in formal and informal situations
3. Understand the emphasis on Pronunciation of English Language in the global world.
4. Apply strategies for Effective Communication in different situations.
5. Participate in conversation, Public Speaking and Group Discussion.

English Language Communication Skills Lab (ELCS) shall have two parts:

- Computer Assisted Language Learning (CALL) Lab
- Interactive Communication Skills (ICS) Lab

**Exercise – I**

**CALL Lab**:

Common Indian Variants in Pronunciation – Differences between British and American Pronunciation

**ICS Lab**:

Spoken vs. Written language- Formal and Informal English- Introducing Oneself and Others

**Exercise – II**

**CALL Lab**:

Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening

**ICS Lab**:

Features of Good Conversation – Strategies for Effective Communication

Role-Play- Making Requests and Seeking Permissions - Telephone Etiquette

**Exercise – III**

**CALL Lab:**

Intonation- Sentence Stress -Weak Forms and Strong Forms

**ICS Lab**:

Descriptions- Narrations- Giving Directions and Guidelines-Giving Instructions – Seeking Clarifications – Asking for and Giving Directions –Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice –Making Suggestions

**Exercise – IV**

**CALL Lab**:

Past Tense Marker and Plural Marker

**ICS Lab**:

Public Speaking – Exposure to Structured Talks - Non-verbal Communication-

Making a Short Speech – Extempore

**Exercise – V**

**CALL Lab:**

Information Transfer

**ICS Lab**:

Group Discussion-Mock Group Discussion sessions

**Text Books :**


1. Suresh Kumar, E. & Sreehari, P. 2009. A Handbook for English Language Laboratories. New Delhi: Foundation
2. Speaking English Effectively 2nd Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
3. Sasi Kumar, V & Dhamija, P.V. How to Prepare for Group Discussion and Interviews. Tata McGraw Hill
4. Hancock, M. 2009. English Pronunciation in Use. Intermediate. Cambridge: CUP
5. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Blackswan. Hyderabad.
6. Hewings, M. 2009. English Pronunciation in Use. Advanced. Cambridge: CUP

7. Marks, J. 2009. English Pronunciation in Use. Elementary. Cambridge: CUP
8. **A textbook of English Phonetics for Indian Students** by T. Balasubramanian (Macmillan)
9. **Lab Manual:** A Manual entitled "English Language Communication Skills (ELCS) Lab Manual- cum- Work Book", published by Cengage Learning India Pvt. Ltd, New Delhi. 2013