MECHANICAL ENGINEERING

S.Y. B. Tech.
Effective from A. Y. 2012-13

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UG Rules and Regulations

Detailed Syllabus

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List of Abbreviations

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<th>Abbreviation</th>
<th>Stands for:</th>
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<td>1</td>
<td>BSC</td>
<td>Basic Science Course</td>
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<td>PSC</td>
<td>Professional Science Course</td>
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<td>3</td>
<td>PCC</td>
<td>Program Core Course</td>
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<td>4</td>
<td>LC</td>
<td>Laboratory Course</td>
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<td>5</td>
<td>HSSC</td>
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Program Education Objectives (PEOs):

1. To prepare the students in order to cater the needs of automotive, design, thermal and manufacturing for Indian as well as multinational industries.

2. To develop competence in the students to understand technological concepts, analyze data in order to formulate and undertake industrial problems and obtain viable solutions.

3. To provide students with in depth knowledge in the core subjects such as mathematics and engineering sciences in order to prepare them for higher studies and inculcate research attitude.

4. To make students aware of the importance of lifelong learning and provide opportunity to work on multidisciplinary projects.

5. To inculcate in student effective communication, management skills, professional ethics, codes of professional practice, induce societal awareness and indoctrinate team spirit.

Program Outcomes (POs):

On successful completion Graduates will demonstrate:

a. Proficiently use mathematical methods, basic sciences, engineering analysis, measurement and instrumentation techniques while attempting engineering problems and articulate viable solutions.

b. Graduates will demonstrate the ability to design, develop and analyze mechanical systems and manufacturing process that meets the required specifications.

c. Graduates will be familiar with modern engineering software tools and equipment to analyze mechanical engineering problems.

d. Graduate will demonstrate an aptitude to identify, formulate and solve problems associated with Mechanical Engineering.

e. Graduate will be able to understand the intricacies and impact of engineering solutions.

f. Graduates will be able to communicate effectively in both verbal and written forms.

g. Graduates will identify societal problems and provide viable engineering solution.

h. Graduates would be capable of self-education and clearly understand the value of lifelong learning.

i. Graduates will be broadly educated and will have an understanding of the impact of engineering on society and demonstrate awareness of contemporary issues.

j. Graduate will demonstrate professional and ethical responsibilities.

k. Graduates will adhere to the various important issues such as green house effect, carbon credit retrofit design concept; relevant norms laid down and exhibit maturity while providing engineering solutions.
B.TECH. RULES and REGULATIONS
For the Award of B. Tech. Degree

1. Short Title and Commencement:
   (a) These Regulations shall be called the “College of Engineering, Pune Regulations for the Award of B.Tech. Degree”;
   (b) They shall come into effect from the date of getting approval from the Board of Governors of the College.
   (c) They shall be applicable for students enrolling for B. Tech. Degree programmes at the College during the year 2007-08.

2. Definitions:
   (a) “B. Tech.” means Bachelor of Technology, an Under Graduate Degree awarded from the University;
   (b) “Board” means Board of Governors of the college;
   (c) “College” means College of Engineering, Pune;
   (d) “Council” means All India Council for Technical Education;
   (e) “Dean” means Dean of the College, with the specific functions also indicated along with the title;
   (f) “Deputy Director” means Deputy Director of the College;
   (g) “Director” means Director of the College;
   (h) “Government” means Government of the Maharashtra;
   (i) “Prescribed” means prescribed by these or any other Regulations of the College;
   (j) “Regulations” means College of Engineering, Pune Regulations for the Award of B. Tech. Degree;
   (k) “Senate” means Senate of the College;
   (l) “University” means University of Pune;

3. Preamble:
The Regulations prescribed herein have been made by the College, an autonomous institution under the University, to facilitate the smooth and orderly conduct of its academic programmes and activities at the B. Tech level. It is expected that the Regulations will enable the students to take advantage of the various academic opportunities at the College and prepare themselves to face the challenges in their professional careers ahead. It may be noted that:

   (a) The provisions made herein shall be applicable to all the B. Tech. Programmes
offered at the College, at present;
(b) They shall also be applicable to all the new B. Tech. Programmes which may be started at the College in the future;
(c) Academic and non-academic requirements prescribed by the Senate have to be fulfilled by a student for eligibility to the B. Tech. Award;

4. **Academic Calendar:**

**Table 1: Suggested Breakdown of Academic Year into Semesters**

<table>
<thead>
<tr>
<th>1. No. of Semesters/Year</th>
<th>Three; Two being Main Semesters (Odd and Even) and One being a Supplementary Semester; <em>(Note: Supplementary Semester is primarily to assist weak and/or failed students through make up courses, wherever possible. However, the College may use this Semester to arrange Add-On Courses for other students and/or for deputing them for practical training elsewhere.)</em></th>
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<td>2. Semester Durations:</td>
<td>Main Semesters: 19 Weeks each; Supplementary Semester: 8 Weeks;</td>
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<tr>
<td>3. Academic Activities (Weeks):</td>
<td>Main Semester (Odd or Even) \ Registration of Courses- 0.5; Course work- 15.5; Examination Preparation-1.0; Examinations- 1.0; Declaration of Results- 1.0; Total: 19; Supplementary Semester (only for make up Courses): Registration of Courses- 0.1; Course Work- 7.0; Examination Preparation-0.2; Examinations- 0.2; Declaration of Results- 0.5; Total: 8; Inter-Semester Recess: After each Main Semester- 2; After Supplementary Semester- 2; Total: 14 (for good students) and 6 (for weak students) <em>(Note: In each Semester, there shall be provision for students for Registration of Courses at the beginning, Dropping of Courses in the middle under the advice of Faculty Members and approved by Departmental Undergraduate Programme Committee (DUPC).)</em></td>
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4. Examinations:

Continuous Internal Evaluation (CIE) and Semester End Examination (ESE), both having equal weightage in the students’ performance in Course Work/Laboratory Work and other activities;

(Note: The CIE shall be conducted throughout the Semester on dates announced in advance by the subject teacher, and its results made known to the students from time to time. This would be of help to the students to decide on Dropping or Withdrawal from Courses in consultation with their Advisors. However, the dates for the Mid-Semester Examination (MSE) which is a part of the CIE and ESE shall be fixed at the College level.

5. Other Items:

- Care shall be taken to ensure that the total number of days for academic work are > 180/year;
- Academic schedules prescribed shall be strictly adhered to by all the Departments;
- Supplementary Semester shall be mainly for Make up Courses, to benefit weak or failed students to the extent possible;
- Students failed in a course shall attend a Course fully when it is offered again, and appear for all components of evaluation;
- Specified Min. /Max. Course load per Semester shall be followed at all times.

(a) Each academic year shall be divided into two main semesters, each of 19 weeks, viz., odd semester (Jul. - Dec.) and even semester (Dec. - Apr.), and an 8-week supplementary semester (Apr.- Jun.).

(b) The College shall arrange regular academic activities for the students during the two main semesters and makeup and other courses for the students during the supplementary semester;

(c) The academic activities in a semester shall normally include course registration, course work, continuous internal evaluation, dropping/withdrawal from courses, semester-end examination, and declaration of results.

(d) The College shall announce the schedule for all the academic activities well before the commencement of the academic year and take all the necessary steps to follow them scrupulously.

(e) The college shall also announce adequate intra-semester and inter-semester breaks for the students and ensure that a minimum of 180 academic working days are available during the academic year.

(f) A typical breakdown of the academic year for the B. Tech programme at the College shall be as suggested in Table 1:

5. Admissions:
(a) The intake capacity of each programme, including the number of seats to be reserved for students of different categories shall be decided by the Board by following the Government directives and Council approvals.

(b) Admissions to the first year of all the programmes shall be made before the start of each academic year, through the Maharashtra Combined Entrance Test (MHCET) conducted by the Government.

(c) The College shall also admit to first year of the programmes, a limited number of students of Non-Resident Indian (NRI), Persons of Indian Origin (PIO) and Foreign National categories, as per Government rules.

(d) There shall also be a merit-based, lateral admission of students having Diploma qualification to the second year of all the programmes at the College in accordance with the Government rules applicable for such admissions.

(e) The College reserves the right to revoke the admission made to a candidate, if it is found at any time after admission that he/she does not fulfill all the requirements stipulated in the offer of admission.

(f) The College also reserves the right to cancel the admission of any student and discontinue his/her studies at any stage of studentship for unsatisfactory academic performance and/or undisciplined conduct.

6. **Residence:**

(a) Interested students may apply for hostel accommodation at the time of admissions, as the College is partially residential and it can admit a limited number of men and women students in the hostels.

(b) The method of admission to students’ hostels, rent payable per each seat allotted and the discipline to be followed by the residents shall be governed by “rules and regulations” framed by the College in this behalf.

(c) Each student selected for hostel admission shall be provided a seat in one of the hostel rooms identified for this purpose and there shall be no family accommodation available in the hostel for married students.

(d) Students residing in the hostels shall adhere to the prescribed hostel discipline and pay the hostel/mess charges regularly, as any failure to do so, may lead to withdrawal of hostel facilities to such students.

(e) Hostel residents shall apply for leave of absence and get the same approved before leaving the hostel even for a few days, as any failure to do so may lead to cancellation of hostel admission to such students.

(f) Students residing in the hostels shall be required to clear all the hostel dues and vacate their rooms at the end of each academic year, as they will be considered for hostel admission afresh for the New Year.

7. **Attendance:**

(a) Each student shall be required to attend at least 75 per cent of all the classes arranged like, lectures, tutorials, laboratories, studios and workshops for being permitted to attend the semester-end examination.
(b) Extra Academic Activities (EAC) like Yoga, NSS, Physical Training, NCC and, Boat Club shall be compulsory for students of the first year, with at least a minimum attendance of 75 percent in each of them.

(c) Students shall also be required to take part in any other academic and non-academic activities and attend the camps, as and when arranged by the College during the academic year.

(d) Students desirous of leave of absence for less than two weeks during a semester shall apply for it in advance to the Head of the Department giving reasons & supporting documents, if any and get it approved.

(e) Absence due to illness or any other reason for a period less than two weeks in a semester, for which a student could not make prior application, may be condoned by the Head of the Department after proper verification.

(f) The Dean, Academic Affairs shall be the Authority for sanctioning the leave of students outside clauses (4) and (5) above, after receiving their applications along with recommendations of the Heads of Departments.

(g) In the case of long absence of a student in a semester with prior approval or otherwise, the Dean, Academic Affairs shall decide whether the student be asked to withdraw from the programme for that particular semester.

(h) In all the cases of leave of absence as per Clauses (4)-(6) above, the period of leave taken shall not be condoned for the purposes of fulfilling the attendance requirements stipulated in the Clauses (1) and (2).

(i) It shall be the responsibility of a student residing in the hostel to intimate the Warden of his/her hostel and also the concerned course instructors regarding his/her absence before proceeding on leave.

8. **Conduct and Discipline:**

(a) All students shall be required to conduct themselves in a manner befitting the students of a national institution of high reputation, within and outside the precincts of the College.

(b) Unsocial activities like ragging in any form shall not be permitted within or outside the precincts of the College and the students found indulging in them shall be dealt with severely and dismissed from the College.

(c) The following additional acts of omission and/or commission by the students within or outside the precincts of the College shall constitute gross violation of code of conduct punishable as indiscipline:

   i. Lack of courtesy and decorum, as well as indecent behaviour;

   ii. Willful damage of property of the College/Hostel or of fellow students;

   iii. Possession/consumption/distribution of alcoholic drinks and banned drugs;

   iv. Mutilation or unauthorized possession of library material, like. books;

   v. Noisy and unseemly behaviour, disturbing peace in the College/Hostel;

   vi. Hacking in computer systems, either hardware or software or both;

   vii. Any other act considered by the College as of gross indiscipline.
(d) In each case above, the punishment shall be based on the gravity of offence, covering from reprimand, levy of fine, expulsion from Hostel, debar from examination, rustication for a period, to outright expulsion.

(e) The reprimanding Authority for an offence committed by students in the Hostels and in the Department or the classroom shall be respectively, the Rector of the Hostels and the Head of the concerned Department.

(f) In all the cases of offence committed by students in jurisdictions outside the purview of Clause (5), the Dean, Students Affairs shall be the Authority to reprimand them.

(g) All major acts of indiscipline involving punishment other than mere reprimand, shall be considered and decided by the Chairman, Students Disciplinary Committee appointed by the Senate.

(h) All other cases of indiscipline of students, like adoption of unfair means in the examinations shall be reported to the Dean, Academic Affairs, for taking appropriate action and deciding on the punishment to be levied.

(i) In all the cases of punishment levied on the students for any offence committed, the aggrieved party shall have the right to appeal to the Director, who shall constitute appropriate Committees to review the case.

9. **Change of Branch:**

(a) Change of branch shall be permissible for a limited number of special cases in the third semester as per following regulations.

(b) Only those students who have completed the common credits required in the first two semesters in their first attempt with a minimum CGPA of 8.5 shall only be eligible for making application for a change of branch.

(c) There shall be a maximum number of only two students admitted in any discipline in the third semester through the branch change rule.

(d) Intending students eligible for change of branch shall apply for the same to the Office of Academic Affairs of the College before the closing date notified at the beginning of odd semester of each academic year.

(e) Such students shall be required to indicate up to three branches, in order of preference to which they wish to change over, as the change shall be strictly based on their merit, subject to availability of vacancies.

(f) The change of branch shall be permitted purely on inter-se merit of all the eligible applicants. The CGPA of students at the end of the second semester shall be considered for rank ordering of the applicants seeking change of branch and in the case of a tie, the MHCET ranks shall also be considered.

(g) All the changes of branch permitted for intending students as per the above clauses shall be effective from their third semester only and no further change of branch shall be permitted after this.

(h) All the changes of branch permitted at this stage shall be final and binding on the applicants and no student shall be permitted, under any circumstances, to refuse the change of branch offered.

(i) The candidates who have sought admission under Tuition Fee Waiver Scheme are not
eligible for the branch change.

10. **Course Structure:**

a) Each course offered in the B. Tech. curriculum at the College shall be listed by using a total of five/six digits, the first two being letters and the remaining being numerals, as follows:

i. The first two letters to represent the Department offering the Course in abbreviated form, e.g., CE for Civil Engineering;

ii. The first numeral that follows to represent the year of the programme, such as 1, 2, 3 and 4, leading to 100,- 400 series;

iii. The next two numerals to represent the Course Number allotted for the subject by the Department, i.e., 01, 02, 03, up to 99;

iv. Thus, as an example, courses offered at the Department of Civil Engineering could be listed from CE 101 up to CE 499;

b) All the courses in the B. Tech. Curriculum shall be unitized, with one credit being assigned to each unit of course work, after the student completes its teaching-learning process successfully.

c) The assignment of credits to course work shall follow the well accepted practice at leading institutions, with one credit being defined to mean:

1. Lecture course conducted for one hour per week in a semester;

2. Tutorial conducted for one hour per week in a semester;

3. Laboratory/Practical conducted for two/three hours per week in a semester;

4. Project work conducted for two hours per week in a semester;

d) Each student for the B. Tech, Degree award shall be required to earn a total of 180 credits during his/her studentship at the College. While a student can register for more than 180 credits at the College, only 180 credits shall be reckoned for the Degree award. On the other hand, a student having less than 180 credits shall have to earn the remaining credits to make up the total to 180 credits so as to qualify for the Degree award. The total number of credits earned to complete the course depends on the academic schema for which the student has enrolled for.

e) In addition to the credit requirement prescribed above for the Degree award, each student shall have to complete the requirements of Extra Academic Activities (EAA) as referred to earlier in Clause 2 of Section 7, during the first two semesters of the programme. All the students shall receive certification as PP (for Passed), and NP (for not passed) in EAA, in the Grade Card. While obtaining certification as PP is a mandatory requirement for the Degree award of a student, this shall not be taken into account for computing the final Grade Point Average.

1. Each student shall register for an average of 22 credits per semester during his/her studentship at the College, with the minimum and
maximum credits being fixed as 16 and 28 credits per semester respectively. The exact number of credits to be registered by a student in a semester in a particular Department shall be decided by his/her Faculty Advisor based on the student’s academic performance in the preceding semester and approval by the Departmental Undergraduate Programme Committee (DUPC).

2. The medium of instruction for course work and examinations at the College shall be English. The course work for the Programme shall be broadly divided into six main subject groups, as follows:
   - Humanities & Social Sciences;
   - Professional Science Courses
   - Basic Sciences including Mathematics;
   - Basic Engineering Sciences & Practice;
   - Professional Subjects;
   - Liberal Learning Courses

3. The total course package for the Programme at a Department shall have the following components:
   - Institutional Core subjects
   - Departmental Core subjects
   - Departmental Elective subjects
   - Other Elective subjects

f) The DUPC shall be responsible for planning the curriculum and syllabi for all the courses included for the Programme for approval by the Senate. However, the Institutional Undergraduate Programme Committee (IUPC) shall be in charge for College wide implementation of course work, time tables and related requirements for the Programme.

g) Each Department shall have the flexibility to include industrial training and/or field work of 8 weeks for all its students as a compulsory requirement for the Degree award and this can be assigned credits, as approved by the Senate. However, these shall be arranged during the supplementary semester period following the sixth semester of studies at the College.

h) Each Department shall assign Faculty Advisors for all its students in consultation with the Dean, Academic Affairs and Dean, Students Affairs. It shall be the responsibility of the Faculty Advisors to help the students in planning their course work and other academic activities at the Department and also to regularly monitor and advise them on their academic and other performance at the College. For students of the first two semesters in any Department, the Dean, Students Affairs may assign Faculty Advisors from among the faculty of Basic Science including Mathematics and HSS Departments.
11. **Registration of Courses:**

(a) Each student shall be required to register for course work by following the advice of the Faculty Advisor at the commencement of each semester on the day fixed for such registration and notified in the Academic Calendar.

(b) Students who fail to register for course work on the notified day may be permitted by the Department for late registration on another day announced in the Academic Calendar after payment of an additional fee fixed by the College.

(c) Only those students shall be permitted to register for course work who have:
   
i. Cleared all dues of the College, Hostel and Library including fines (if any) of the previous semester,
   
ii. Made all the required advance payments towards the College and Hostel dues for the current semester before the closing date, and
   
iii. Not been debarred from registration of courses on any other specific ground.

(d) Each student shall fulfill the following conditions at the time of registration of course work in any semester:
   
i. Each student of the first year shall register for all the courses in the first two semesters, with flexibility to drop one/two courses up to the minimum permissible limit of 18 credits in each case. Similarly Direct Diploma students will also register for all courses in third and fourth semester.
   
ii. A student shall be permitted to register for more than the average course load, i.e., up to a maximum of 28 credits, if he/she has shown outstanding performance in course work in the previous semesters, i.e., CGPA>=8.0.
   
iii. On the other hand, a student whose performance is not so good in the preceding semesters, i.e., =<5.0, shall be permitted to register 18 credits, the students who have secured CGPA in between 5 and 6 are allowed for normal credits (i.e. The credits offered by the department in that semester) and the students who have secured more than 6 CGPA are allowed to register for one additional course. The students are mandatorily required to register for backlog subjects first. The faculty advisor is required to check for the pre-requisites if any at the time of registration.

(e) All the students shall note the following special features of the credit system, which shall be strictly followed at the College:
   
i. There shall be no re-examination facility as in the conventional academic system and ESE shall be conducted for the course once in a semester, except to meet the needs of students specially permitted by the College.
   
ii. A student shall have to re-register in all the failed courses (i.e., Getting Grade FF) at any further semester when they are offered again, freedom being given to the student to change the course only if it is an elective.
   
iii. Also, a student getting certification as NP in the Extra Academic Activities (EAC), shall re-register for them in a following semester/s until he/she obtains certification as PP.
(f) A student shall have the possibility to drop a course in the middle of a semester as per the Academic Calendar, without mention in the Grade Card, with the concurrence of the Faculty Advisor, and after intimating the concerned course instructor/s and the academic section. However, it shall not be possible for a student to register for an alternative course in that semester.

12. **Supplementary Semester:**

(a) Departments shall have the flexibility to conduct supplementary semesters during summer months, as per the Academic Calendar. Such a semester shall be offered on the recommendation of DUPC and with the approval of the Dean, Academic Affairs. A student shall be allowed to register for a maximum of three subjects in a supplementary semester.

(b) The supplementary semester shall be utilized primarily to facilitate the failed students to attend the courses in which they have failed and not for launching any new courses for credit. However, a Department shall be free to arrange any Add-On courses for its students during this semester.

(c) The academic activity in the supplementary semester shall be at double the rate as compared to a normal semester; e.g., 1 credit of course work shall require two hours/week in the class room, so that the contact hours are maintained the same as in a normal semester. It shall also be necessary to fulfill the requirements of CIE and ESE for all the courses like in a normal semester.

(d) Courses planned for the supplementary semester shall be announced by the Dean, Academic Affairs in each year, well before the conclusion of the even semester. Students intending to avail of this facility shall have to register for the courses offered by paying the prescribed fees within the stipulated time.

(e) It shall be the responsibility of the Department to plan in advance the faculty and non-teaching staff requirements to conduct the supplementary semester and take necessary steps including the institutional approvals for organizing the same.

(g) The student who are either dropped or detained in the course/s during regular semester is not allowed to register for that course/s in summer.

13. **Programme Duration:**

(a) The Programme duration for a student to complete the academic and other requirements at the College and qualify for the award of Degree by the University shall be normally 8 semesters.

(b) However, it shall be possible for an outstanding student to qualify for the Degree award in less than eight semesters, by registering for more number of credits i.e., up to the maximum permissible limit of 28 credits per semester from the third semester onwards to complete the Programme requirements of 180 credits. In such a case, the College shall issue a Provisional Certificate to the student who shall await the completion of eight semesters for the Degree award by the University.

(c) This flexibility shall also enable academically weaker students to conduct their studies at a slower pace and complete their Degree requirements in more than eight semesters. The maximum duration for the course completion will be 12 semesters.
(d) Clause (3) above shall be applicable to two types of students at the College:

i. Those wishing to complete the Degree requirements comfortably without encountering failure in any course;

(e) In both the above cases, a student shall have to complete the Programme requirements for the Degree of 180 credits within 12 semesters. Failure to complete the Programme requirements by any student in this period shall lead to the cancellation of his/her admission to the College forthwith. The Senate on case to case basis on the recommendations of the Director and Dean-Academics can extend the term.

(f) A student will not be awarded degree if his/her CGPA at the end of the course is less than 5. For such students the performance improvement scheme is recommended wherein he/she is eligible to take any three subjects for the improvement.

14. Temporary Withdrawal:

(a) Student shall be permitted to withdraw temporarily from the College on the grounds like prolonged illness, grave calamity in the family or any other serious happening. The withdrawal shall be for periods which are integral multiples of a semester, provided that

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

ii. The College is satisfied that, even by taking into account the expected period of withdrawal, the student has the possibility to complete the Programme requirements of 180 credits within the time limits specified earlier.

iii. The student shall have settled all the dues or demands at the College including those of Hostel, Department, Library and other units.

(b) A student availing of temporary withdrawal from the College under the above provision shall be required to pay such fees and/or charges as may be fixed by the College until such time as the students name appears on the Roll List. However, it shall be noted that the fees/charges once paid shall not be refunded.

(c) Normally, a student shall be entitled to avail of the temporary withdrawal facility only once during his/her studentship of the Programme at the College.

15. Termination from the Programme:

A student shall be required to leave the College on the following grounds

i. Absence from classes for more than six weeks at a time in a semester without leave of absence being approved by the competent authorities, shall result in the student’s name being struck off the College rolls.

ii. Failure to meet the standards of discipline as prescribed by the College from time to time shall also result in the student being recommended by the Students Disciplinary Committee to leave the College.
16. **Performance Assessment:**

(a) There shall be achievement testing of all the students attending a course, like lecture course, laboratory/design/drawing course or a combination of the two. This shall be in two parts, as follows, both of them being important in assessing the students performance and achievement in the particular course:

1. **Sessional**, involving *Continuous Internal Evaluation (CIE)*, to be normally conducted by the subject teacher all through the semester; This shall include mid-term tests, weekly/fortnightly class tests, home work assignments, problem solving, group discussions, quiz, seminar, mini-project and other means. The subject teacher shall announce the detailed methodology for conducting the various segments of CIE together with their weightages at the beginning of the semester.

2. **Terminal**, often designated as *End Semester Examination (ESE)*, to be conducted by the subject teacher, preferably jointly with an external examiner; This shall include a written examination for theory courses and practical/design/drawing examination with built-in oral part for laboratory/design/drawing courses.

3. Both CIE and ESE shall have equal (50:50) weightage. A student’s performance in a subject shall be judged by taking into account the results of CIE and ESE together.

4. The evaluation of the project work shall be based on Sessional Work assigned by the project supervisor, seminar presentation, project report and assessment by Project Evaluation Committee, as covered in Clause(7) later in this Section.

5. In the case of other requirements, such as, seminar, comprehensive viva voce and EAA the assessment shall be made as determined by the Grade Awarding Authority of the College.

6. While the conduct of CIE for a course shall be the responsibility of the subject teacher and the Department concerned, MSE and ESE shall be conducted centrally by the Examination Section of the College. The records of both CIE and ESE shall be maintained by the Examination Section.

7. The performance of students at every stage of the CIE shall be announced by the concerned subject teacher within a fortnight of the date of the particular assessment. The subject teacher shall also show the assessed answer books to the students before submission of the final marks to the Controller of Examinations.

8. The concerned subject teacher shall also be responsible to award letter grades to the students after the ESE is completed and to submit the final results of the course within one week of the last date of ESE to the Controller of Examinations through the Head of his/her Department.

(b) **Question Papers:** For being able to conduct achievement testing of the students in an effective manner, good question papers shall be used as the principal tool, making it necessary for the question papers at CIE and ESE to:

i. Cover all sections of the course syllabus uniformly;
ii. Be unambiguous and free from any defects/errors;
iii. Emphasize knowledge testing, problem solving & quantitative methods;
iv. Contain adequate data/ other information on the problems assigned;
v. Have clear and complete instructions to the candidates.

(c) Therefore, the question papers, particularly at ESE, shall be set covering the entire syllabus and the students given opportunity to answer questions from the full syllabus of the course by restricting their choice out of each unit in the syllabus. For this to be realized,

(d) Besides, the course syllabi shall be well drafted, be defect-free and properly unitized (or modularized) to enable the distribution of questions in the question papers to cover the whole syllabus. These aspects shall have to be taken into account, in particular, by the concerned DUPCs.

(e) There shall be two types of questions to be set by the subject teacher for the question papers at both CIE and ESE, viz.,

   i. **Multiple Choice Questions**, having each question to be answered by tick marking the correct answer from the choices (commonly four) given against it. Such a question paper shall be useful in the testing of knowledge, skills, comprehension, application, analysis, synthesis, evaluation and understanding of the students. Usually, no more than 15- 20% of the questions in a paper for CIE or ESE shall be of this type.

   ii. **Comprehensive Questions**, having all questions of the regular type to be answered in detail. Such a question paper shall be useful in the testing of overall achievement and maturity of the students in a subject, through long questions relating to theoretical/practical knowledge, derivations, problem solving and quantitative evaluation.

(f) **Examinations**: The College shall maintain a high standard in both CIE and ESE and ensure the declaration of final results including SGPA and CGPA of the courses attended by a student in a semester before the end of the semester as per the Academic Calendar. For meeting these requirements, the College shall take the following steps:

i. **CIE** shall be conducted exclusively by the subject teacher, who shall spell out the components of CIE in advance, maintain transparency in its operation, declare the evaluation results in time and return the answer scripts and assignment sheets to the students on a regular basis after the evaluation is completed. The teacher shall also solve the questions asked in the tests at the tutorial sessions for the benefit of weak students.

ii. **ESE** shall be preferably conducted jointly by the subject teacher and an external examiner appointed for this purpose by the College. In this case, considering the tight time schedule for the various tasks connected with ESE, the external examiner shall be associated with the teacher only in the setting of the question paper.

iii. The answer scripts of ESE shall be evaluated by the subject teacher only; but, an external review of the entire ESE shall be conducted under the aegis of the Board of Examiners of the College before declaring the results. This step shall be useful to the College to gain the confidence of the University on the fairness and transparency in the system.
iv. Suggested passing standard for each of the courses shall be 50 marks from the CIE and ESE taken together.

v. Attendance at all examinations, both CIE and ESE of each course shall be compulsory for the students. Students having the following deficiencies shall not be permitted to attend the ESE:

A. Disciplinary action by the College pending against him/her;
B. Irregular in attendance at lecture/laboratory and other classes;
C. Failure to meet the standards of attendance prescribed;
D. CIE Performance far below the passing standard

(g) In the event of a final year student failing in a Laboratory course or scoring very low marks in the CIE of a subject or falling seriously ill during ESE, the subject teacher concerned shall have the discretion to grant the student extra time, not exceeding 12 weeks for satisfactorily completing the concerned course after awarding an I grade. If no such extra time is sought/granted, the concerned student shall have to re-register for the same in a succeeding semester and take steps to fulfill the requirements for the Degree award. The I grade shall be required to be converted into a regular grade within stipulated period indicated in the academic calendar.

(h) Re-Examination: There shall be no re-examination for any course at the College to take care of the failed students. Hence, the failed students shall re-register for the course (the same course, if it is hard core, or an alternative course, if it is a soft core or an elective) when it is offered again (either in a main or supplementary semester) and fulfill the passing standards laid down to earn the specified credits. However, there shall be make-up examination for a course to take care of students with the I or X grades in ESE.

(i) Make Up Examination: This facility shall be available to students who may have missed to attend the ESE of one or more courses in a semester for valid reasons and given the I grade; also, students having the X grade shall also be eligible to take advantage of this facility. The make up examination shall be held as per dates notified in the Academic Calendar. However, it shall be possible to hold a make up examination at any other time in the semester with the permission of the Dean, Academic Affairs. The standard of conducting this examination shall be the same as the normal ESE.

(j) Evaluation of Project work The project work shall be normally conducted in two stages, spread over one or two sequential semesters.

i. At the end of first stage, the student shall be required to submit for evaluation, a preliminary report of the work done before a prescribed date to the Project Coordinator, DUPC and present the same before an Internal Project Evaluation Committee. This shall be followed by taking up the second stage of work either in the same or the following semester.

ii. The Controller of Examinations shall receive a panel of names from the Chairman, DUPC for identifying the project examiners for the student, at least two weeks before the submission of the second stage of project work. This shall comprise of three unbound, typed copies of the project report (one for each examiner), prepared according to the prescribed format to be submitted
to the Department at least one week before the date of oral examination.

iii. The Department shall record the date of submission of the project report and arrange to send copies of the same to the examiners a few days before the date fixed for the oral examination. The project coordinator shall notify the date of the oral examination to the examiners and also the student, with a copy marked to the Controller of Examinations. Then the project report shall be evaluated by the Project Evaluation Committee and the result submitted to the Project Coordinator, who in turn shall forward it to the Controller of Examinations.

iv. On successful completion of the oral examination, the student shall be required to submit two bound copies of the final, corrected project report, one being for the Department and the other for the project supervisor(s).

v. A student desirous of extension of time, up to a maximum of 3 months from the prescribed date for submission of the project report, shall seek permission for the same from the Project supervisor(s) and Head of the Department. The DUPC shall consider such requests, case by case, before giving the permission.

vi. If the DUPC is convinced that the progress of a student in project work is insufficient, the concerned students shall be temporarily awarded the I grade. Further, if the project report of the student is not submitted within the extended time period, the I grade shall be automatically converted to the FF grade.

vii. Such of the students who fail in the first stage assessment of project work shall be required to re-register for the first stage in the following semester. Likewise, those who obtain the FF grade in the second stage assessment shall be required to re-register for the same in the subsequent semester(s).

(k) The evaluation of performance in EAAc shall be done by the concerned faculty members, who shall communicate the student's performance to the Examination Section, soon thereafter.

17. **Grading System:**

(a) The College shall follow the award of letter grades and the corresponding grade points to the students based on their performance at the end of every semester, as given in Table 2. In addition to the grades given in the Table 2, the instructors shall use two transitional grades I and X as described in Clause (3) in this Section.

<table>
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17
(b) A student is considered to have completed a course successfully and earned the credits if he/she secures a letter grade other than I, 'X' or FF in that course. Letter grade FF in any course implies failure in that course.

(c) The Transitional Grades I and 'X' shall be awarded by the teachers in the following cases:

   i. Grade I to a student only on satisfactory attendance at classes and performance in other components of assessment, but absence from ESE in a semester for valid and convincing reasons acceptable to the Department, such as,
      A. Illness or accident, which disabled him/her from appearing at the examination;
      B. A calamity in the family at the time of the examination, which required the student to be away from the College;
   
   ii. Grades X to a student on his/her overall performance in the course during the semester, highly satisfactory, i.e., high CIE rating, but a very low ESE performance resulting in an overall F Grade in the course.

   iii. All the I and X grades awarded to the students shall be converted by the teachers to appropriate letter grades and communicated to the Academic Section (through Head of the Department) within two days of the respective make-up ESEs. Any outstanding I and X grades two days after the last scheduled make-up ESEs shall be automatically converted to FF grade.

(d) A Semester Grade Point Average (SGPA) shall be computed for all the students in a Department for each semester, as follows:

\[
SGPA = \frac{(C_1 \times G_1 + C_2 \times G_2 + C_3 \times G_3 + \ldots + C_n \times G_n)}{(C_1 + C_2 + C_3 + \ldots + C_n)}
\]

where, \(n\) is the number of courses registered during the semester, \(C_i\) is the number of credits allotted to a particular course, and \(G_i\) is the grade points corresponding to the grade awarded for the course.

(e) A Cumulative Grade Point Average (CGPA) shall be computed for all the students in a Department at the end of each semester by taking into consideration their performance in the present and the past semesters as follows:

\[
CGPA = \frac{(C_1 \times G_1 + C_2 \times G_2 + C_3 \times G_3 + \ldots + C_m \times G_m)}{(C_1 + C_2 + C_3 + \ldots + C_m)}
\]
C_2 + C_3 + \ldots + C_m)

where, m is the number of courses registered upto that semester, C_i is the number of credits allotted to a particular course, and G_i is the grade points corresponding to the grade awarded for the course.

(f) Whenever, a student repeats or substitutes a course in any semester, the lower of the two grades obtained by him/her in the course shall be ignored in the computation of CGPA from that semester onwards and the students shall be given the benefit of a higher grade.

(g) Both the SGPA and CGPA shall be rounded off to the second place of decimal and recorded as such for ease of presentation. Whenever the CGPAs are to be used for the purpose of determining the merit ranking in a group of students, only the rounded off values shall be made use of.

(h) When a student gets the grade I or X for any course during a semester, the SGPA for that semester and the CGPA at the end of that semester shall be tentatively calculated ignoring the I and X graded course(s). The SGPA and CGPA for that semester shall be finally recalculated after conversion of I and X grade(s) to appropriate grade(s), taking into account the converted grade(s).

(i) Other academic requirements for the Programme include the following two certifications as indicated earlier in clause (5) of Section 10, viz., PP (Passed) and NP (Not Passed) for EAA. However, there shall be no grade points are associated with these certifications and they do not figure in the calculation of SGPA or CGPA. But, obtaining a PP shall be a mandatory requirement to qualify for, the Degree award.

(j) It shall be open to each student to take additional courses for audit from the fifth semester onwards, with the concurrence of the Faculty Advisor. Students having CGPA \( \geq 8.0 \) shall be normally encouraged to take such courses. While the performance of the student in audited courses shall be included in the Grade Card, they do not contribute to SGPA or CGPA of the concerned student.

18. **Method of Awarding Letter Grades:**

(a) The subject teacher(s) shall award the letter grade(s) to students based on the marks secured by them in both CIE and ESE together in the course(s) registered. This shall be done by following a relative grading system based on the use of statistics, for which the IUPC shall make available an appropriate software package.

(b) The subject teacher(s) shall submit two copies of the result sheet for each course, giving both the marks and the grades awarded to the Head of the Department, before the due date specified in the Academic Calendar. This shall be forwarded to the Controller of Examinations soon thereafter by the Head of the Department, after preliminary scrutiny and moderation (if necessary) at the DUPC level.

(c) All the evaluated answer scripts of CIE in a subject shall be returned to the students from time to time during the semester. However, the answer scripts of ESE shall only be shown to the students during the specified period after the evaluation and the detailed marks sheets together with ESE answer scripts and any other relevant
papers connected with ESE shall be submitted by the subject teacher(s) to the
Controller of Examinations who shall hold it for a period of at least one semester.
Steps shall be taken to destroy the same only after obtaining permission from the
Dean of Academic Affairs at the end of the prescribed period.

(d) Appeal: A student shall have the possibility to appeal to the Director against a
subject teacher for awarding lower grade in a course than that expected by
him/her, on payment of prescribed fees, before the commencement of the next
semester. In such a case, the DUPC shall arrange a meeting of the aggrieved
student together with a Committee comprising of the subject teacher, another
subject expert from the College and the Head of the Department, who shall
reconsider the evaluation done, show the answer script to the student. If the
student is satisfied, the matter shall be closed at this stage. On the other hand, if
a revision of marks allotted is called for, the same shall be carried out and all the
records, including the Grade Card, corrected soon thereafter. In the latter case,
the prescribed fee paid by the student shall be returned.

(e) Withholding of Grades: The Grades of a student in a semester shall be withheld
and not declared if the student fails to pay the dues to the College or has
disciplinary action pending against him/her.

9. **Eligibility for the Award of Degree:**

(a) A student shall be eligible for the award of B. Tech. Degree from the College
and the University provided, he/she has:

(b) The Senate shall be the Recommending Authority for the award of B. Tech.
Degree to students fulfilling the requirements specified under Clause (1) above and
the Board shall be the Approving Authority.

(c) The Degree award shall then be granted by the University.

i. Completed all the prescribed credit requirements for the award of Degree with
grade DD or higher, in each of the courses, like Theory, Laboratory, Studio,
Workshop, Seminar and Project Work;

ii. Satisfactorily completed all the non-credit requirements with PP certification,
covering EAA and Industrial Training, Field work, (if any);

iii. Obtained a CGPA of >= 5.00 at the end of the semester in which he/she
completes all the requirements for the award of Degree;

iv. Paid all the dues to the College including the Department, Hostels, Library and
other units; and,

v. No case or disciplinary action pending against him/her.
CURRICULUM STRUCTURE OF S. Y. B. Tech (Mechanical)
Effective from 2012-13

I-Semester:

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CURRICULUM STRUCTURE OF S. Y. B. Tech (Mech.)-Direct Admitted Diploma Students

Effective from 2012-13

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MA 201  Engineering Mathematics - III

Teaching Scheme
Lectures : 3 hrs/week
Tutorial : 1 hr/week

Examination Scheme
100 marks: Continuous evaluation-
Assignments /Quiz- 40 Marks,
End - Sem Exam - 60 Marks

Unit 1  (4 hrs)

Review of Vector Algebra:
Vectors in 2 and 3 dimensional space, dot and cross product of vectors.

Unit 2  (8 hrs)

Gradient, Divergence and Curl:
Vector and Scalar functions and Fields, Derivatives, Gradient of a Scalar field, Directional
derivatives, Divergence and Curl of a Vector field.

Unit 3  (8 hrs)

Vector Integral Calculus:
Line Integrals, Line integrals independent of path, Green’s theorem in plane, surface integral,
Divergence theorem and Stoke’s theorem.

Unit 4  (8 hrs)

Fourier Series:
Periodic functions, trigonometric series, Fourier series, half range series.

Unit 5  (4 hrs)

Partial Differential Equations:
Basic concepts, method of separation of variables.

Unit 6  (8 hrs)

Higher Applications of Partial Differential Equations:
One and Two dimensional wave equation, one dimensional heat equation, Laplace equation.

Text Books:

  Education, Delhi
Reference Books:

- George F Simmons, “B. V Differential Equations With Applications and Historical Notes”, McGraw-Hill Science/Engineering/Math

Course Outcomes:

- Able to recognize the significance of basic concepts of Mathematics in Mechanical Engineering.
- Able to apply the various mathematical principles studied towards Mechanical applications.
- Able to prepare mathematical model for various applications.
- Able to obtain numerical solution to mechanical applications.

ME 201  Engineering Thermodynamics

Teaching Scheme
Lectures : 3 hrs/week
Tutorial : ----

Examination Scheme
100 marks: Continuous evaluation-
Assignments /Quiz- 40 Marks,
End - Sem Exam - 60 Marks

Unit 1  (5 hrs)
Basics of Thermodynamics:
Approaches of study, Properties, States and Equilibrium, Zeroth Law of thermodynamics,
Temperature scale Systems, Forms of Energy, Flow and Non flow processes and Cycles,

Unit 2  (6 hrs)
Properties of Pure Substances:
Phases of pure substances, property diagrams for phase change processes, vapor pressure
and phase equilibrium, property tables, ideal gas equation of states, Properties of gas mixture:
Ideal and Real gases, compressibility factor

Unit 3  (7 hrs)
First law of Thermodynamics:
Work and Heat, First law of thermodynamics: closed system, Internal energy, Enthalpy,
Latent heat, Specific heats, Application of first law to processes and cycles, First law of
thermodynamics: control volumes, Application of first law to steady flow processes.
Unit 4

**Second law of Thermodynamics:**
Limitations of first law, Statements of second law, reversibility and irreversibility, Carnot theorem and cycle, application of Carnot cycle to heat engine, refrigerator and heat pump.

Unit 5

**Entropy and Availability:**

Unit 6

**Thermodynamic Cycles:**
**Air Standard Cycles:**
Analysis of Otto cycle, Diesel cycle, dual cycle, Brayton cycle, Air standard and Carnot efficiencies

Unit 7

**Vapor power cycles:**
Vapor Processes, Work and Heat transfer, Change in entropy, Rankine cycle: Comparison of Rankine and Carnot cycle, Work done and efficiency, Specific steam consumption, Regeneration, Reheating, and Co-generation

**Text Books:**
- Rayner Joel, “Basic Engineering Thermodynamics”, Addison Wesley Longman

**Reference Books:**

**Course Outcomes:**
- Student will gain knowledge of basic concepts of thermodynamics and their application to energy conversion devices, such as Boiler and Compressors.
• Will be able to understand the important phenomenon of heat and work and their correlation.
• Able to apply the concepts of Carnot theorem to applications such as heat pump and refrigerator.
• Will be able to learn various performance parameters and their estimations in respect to trials on Boiler and Compressor.
• Students will acquire the knowledge about the phenomenon of steam generation and properties of steam.
This subject forms base for study of subjects like, Heat transfer, Internal Combustion engines, Refrigeration, Air Conditioning & Power Plant Engineering.

ME 203  Machine Drawing and Computer Graphics

Teaching Scheme
Lectures : 2 hrs/week
Tutorial : ----

Examination Scheme
100 marks: Continuous evaluation-
Assignments /Quiz- 40 Marks,
End - Sem Exam - 60 Marks

Unit 1
(4 hrs)

Introduction to Machine Drawing:
Dimensioning Techniques, Representation of standard components such as Screw Threads, Screw fasteners, keys, couplings, bearings, pulleys, brackets, gears, locking arrangements, Rivets and riveted joints, Welding symbols.
Pipe Joints :- Expansion joints, stuffing box and glands, piping layouts, conventional representation of pipe fittings, valves, joints, etc.

Unit 2
(6 hrs)

Limits, Fits and Tolerances:
ISO system of tolerance, Tolerance charts, Hole - base and shaft -base system of tolerance, Types of fits, symbols and applications.
Geometric Tolerances: Introduction, Nomenclature, Rules, Symbols, values obtained from various manufacturing processes.

Unit 3
(5 hrs)

Surface Roughness & Production Drawing:
Surface Textures, Roughness values and Roughness Grades, Machining symbols Conventional Representation on part drawings.
Production Drawing: Assembly and part drawings, Blue print reading, study and preparation of bill of materials.

Unit 4
(2 hrs)

Basic Drafting commands:
Drawing basic entities, Modify commands, Edit commands .. etc, Layers, Block attributes, Viewers, Design center utilities, Solid Modelling, Editing of solids, 3-D operations such as shading and rendering etc.

**Unit 5**

(5 hrs)

**Introduction to AutoLisp and Visual lisp:**
Concept of parametric programming, Need and importance of Autolisp programming. Data types in Autolisp: Integers, Real numbers, Strings, Symbols, Lists and File Descriptors. Data types conversions: Integer to real, string list, real to integer, string lists. Reading and writing to the screen by using visual lisp consoles.

**Unit 6**

(8 hrs)

**Inputs in AutoLisp Programming:**
Get functions for user input. Use of lists and the entities: Filtering from lists, editing/ modifying the lists, entity managing and modifying the entities. Arithmetic and Logical Functions: Additions, Subtraction, Multiplication, Division, sorting the data for deciding maximum and minimum numbers, remainders, exponential operation, trigonometric functions, AND, OR etc. Decision-making and looping in Autolisp, File handling functions (changing the properties of AutoCAD entities). Block attributes and extracting the attribute data.

**Text Books:**
- George Omura, “ABC of Autolisp”, BPB Publications, New Delhi

**Reference Books:**
- Auto CAD & Autolisp Manuals by AutoDesk Corp., USA
- Faculty of Mechanical Engineering, “Design Data”, PSG College of Tech, Coimbatore

**Course Outcomes:**
- Student will gain knowledge of various ISO standards used in machine drawing and apply them in product drawing.
- Will be able to understand the conventions displayed on a product drawing and instruct/ incorporate necessary machining processes to attain the same.
- Able to use the important entities like Limit, Fit, Tolerance and Surface Finish, towards their use in the drawing.
- Able to effectively communicate through drawings and use software like AutoCAD and Autolisp.
This subject enhances the capability of the students to effectively communicate through the product drawings and is useful while studying the subjects like, Machine Design, Manufacturing processes, Theory of machines.

CE 217  Strength of Materials

**Teaching Scheme**
- Lectures: 3 hrs/week
- Tutorial: ----

**Examination Scheme**
- 100 marks: Continuous evaluation-
- Assignments /Quiz- 40 Marks,
- End - Sem Exam – 60 Marks

**Unit 1**  
(6 hrs)

**Simple stresses and strains:**
- b) Axial force diagram, stresses, strains and deformation in determinate and indeterminate homogeneous and composite bars under concentrated loads, self-weight and temperature changes.

**Unit 2**  
(8 hrs)

- a) **Shear force and bending moment diagrams:**
  Concept and definition of shear force and Bending Moment in beams due to concentrated load, UDL, uniformly varying loads and couples in determinate beams. Relation between SF, BM and intensity of loading, construction of SF, and BM diagrams for cantilevers, simple compound beams and bend.

- b) **Stresses due to bending:**
  Theory of simple bending, concept and assumptions, Derivation of Flexure formula, Bending stress distribution diagram, Moment of resistance and section modules calculations.

**Unit 3**  
(7 hrs)

- a) **Shear stress distribution in beams:**
  Shear stresses concept, derivation of shear stress distribution formulae, shear stress distribution diagram for common symmetrical sections, maximum and average shear stress, shear connection between Flange and web. Bending of curved bars beams, stresses in ring, chain link, and crane hooks.

- b) **Torsion of circular shaft:**
  Theory of torsion of shafts of circular, cross section. Assumptions, Derivation of torsion formulae, stresses strains and deformation in determinate and indeterminate shafts of hollow, solid, homogeneous and composite circular cross section subjected to twisting moments, stresses due to combine torsion, bending and axial force on shafts.
Unit 4

a) **Principal stresses and principal strain:**
Normal and shear stresses on any oblique planes and concept of principal planes and principal planes by analytical and graphical methods (Mohr’s circle for a 2-D stress state).

b) **Pressure Vessels:**
Stresses, strains and deformation in thin walled seamless cylindrical and spherical vessels due to internal fluid pressure. Change in volume, effects of additional compressible or Incompressible Fluid injected under pressure. Thick cylinders. Derivation of Lane’s equation for stresses.

Unit 5

a) **Axially loaded columns:**
Concept of critical load and buckling, derivation of Euler’s formulae for buckling load with hinged ends, concept of equivalent length for various end conditions. Rankeine’s formulae, safe load on column, Limitations of Euler’s formulae.

b) **Strain energy and impact.**
Concept of strain energy, derivation and use of expressions for deformation of axially loaded members under gradual sudden and impact loads.

Unit 6

**Slope and Deflection of Determinate Beams:**
a) Concept and definition, relation between B.M., slope and deflection slope and deflection by double integration method (McCauley’s method).
b) Slope and Deflection in determinate beams by Moment Area method and conjugate beam method.

**Text Books:**
- Beer and Johnston, “Strength of Materials” CSB Publisher

**Reference Books:**
- Gere &Timoshenko, “Mechanics of Material”, CSB Publisher 1984
- Timoshenko and Young, “Strength of Materials”, CSB Publisher

**Course Outcomes:**
- Student will be able to understand the concepts of various stresses and their significant effects in context with engineering applications.
• Student will be able to effectively use the concepts of shear force and bending moment diagrams in design of machine elements.
• Will be able to compute the principal stresses and Strains by analytical and graphical methods (Mohr’s circle of stress 2-D)
• Able to use expressions for estimation of deformation in axially loaded members under gradual, sudden and impact loads.
• Able to estimate the Slope and Deflection in determinate beams by Moment Area method and conjugate beam method.

This subject enables the student to understand the important concepts of stress and strain, their significance in concept with engineering applications and is useful while studying the subjects like, Machine Design, Theory of machines, Dynamics of Machines.

### PE 207 Manufacturing Engineering - I

#### Teaching Scheme
- Lectures: 3 hrs/week
- Tutorial: ----

#### Examination Scheme
- 100 marks: Continuous evaluation-
- Assignments /Quiz: 40 Marks,
- End - Sem Exam – 60 Marks

### Unit 1 (6 hrs)

**Hot and cold working of metals:**
Principles of rolling, forging, drop, press, upset, roll forging, extrusion, drawing, spinning, effect of hot working. **Cold working processes**, Cold rolling, swaging, forging, extrusion-forward, backward and impact roll forming, tube drawing, wire drawing, spinning, shot penning, high energy rate forming, sheet metal working, types of presses, drives, different operations and types of dies.

### Unit 2 (7 hrs)

**Joining processes:**

### Unit 3 (8 hrs)

**Foundry- Pattern making, moulding and casting:**
Sand casting, types of pattern material, pattern making allowances, core print moulding, sand properties and testing, hand and machine moulding, core boxes, core making, melting and pouring, melting furnaces- Cupola, fuel fired, electric arc and induction furnaces. Cleaning, finishing and heat treatment of casting, defects in casting lost foam processes, shell moulding and investment casting. Permanent mould dies casting- Die-casting, low-pressure permanent
mould casting, hot and cold chamber processing, centrifugal casting, semi centrifugal casting and continuous casting

Unit 4 (6 hrs)

Lathe and drilling Machine:
Turning and boring, lathe construction, accessories and operations. Thread cutting- single and multi start threading, concept of speed, feed and depth of cut. Introduction to boring Machines, Capstan and Turret lathe. Fundamentals of drilling processes, hoist, drill geometry, tool holder, types of drilling machines, operations performed on drilling machines, type of drill. Reaming processes and reamer types.

Unit 5 (7 hrs)

Milling, shaping and planning:
Fundamental aspects, cutter types and geometry, Operations performed on milling machine, dividing head method of indexing. Construction, working and operations performed on shaper, planer, and broaching machines

Unit 6 (7 hrs)

Grinding:
Grinding wheels, wheel marking, wheel selection, wheel mounting, types of grinding machines. Honing, lapping, super finishing, buffing and burnishing processes

Text Books:

Reference Books:
- Begeman, “Manufacturing processes”, Asia Publishing house Bombay

Course Outcomes:
- Students are exposed to various manufacturing processes and are able to understand the influence of process parameters significantly affecting them.
- Developing competency in order to select appropriate machining process depending upon desired output characteristics.
- Will be able to select/suggest machining process/ processes required for a component manufacturing.
• Students will gain knowledge of component manufacturing at optimum cost.

This subject enables the student to understand various manufacturing processes and can apply the knowledge in engineering applications.

ME 205  Engineering Thermodynamics Laboratory

Teaching Scheme:  
Practical: 2 hrs/week

Examination Scheme:  
100 marks: Term work - 50,  
Practical and Oral- 50

List of Experiments: Any Eight of the following:
1) Calibration of pressure gauges using dead weight pressure gauge
2) Demonstration of applications of first and second law of thermodynamics
3) Demonstration and Study of water tube boiler(Babcock and Wilcox boiler)
4) Demonstration and Study of boiler mountings and accessories
5) Determination of dryness fraction of steam
6) Trial on a boiler / heat balance sheet
7) Calibration of temperature measuring devices
8) Trial on bomb calorimeter
9) Visit to a industry/sugar factory for study of cogeneration plant
10) Trial on heat exchangers

Course Outcome:
• Students will be able to establish correlation between theory and practical.
• Students will be able to perform trials independently and acquire hands on experience.
• Students will gather knowledge of various testing procedure and will be able to use standards.
• Students will be exposed to the important phenomenon of heat balance and cogeneration.
• Inculcate interest to carryout multidisciplinary projects.

ME 207  Machine Drawing and Computer Graphics Laboratory

Teaching Scheme:  
Practical: 4 hrs/week

Examination Scheme:  
100 marks: Term work - 50,  
Practical and Oral- 50

Term work:

1) One full imperial drawing sheet consisting the drawing/ sketches of representation of standard components, symbols of pipe joints, weld joints, rivet joint etc, surface finish symbols and grades, Limit, fit and tolerance related sketches.
2) One full imperial drawing sheet consisting of assembly and details of any one standard component such as valves, components of various machine tools, pumps etc.
3) Assignment of AutoCAD:
   Orthographic Projections with three views of any one simple machine component such as bracket, Bearing Housing or Cast component for Engines such as Connecting rod, Piston etc and its' 3-D model.

Assignments of Autolisp programming:

1) Introductory programmes (minimum two on each) such as
   a) Data type conversion involving users input data, blinking on the screen use of trigonometry for solving graphics problems etc.
   b) Programmes to draw geometric figure or their combinations with changes in the type of input required, for those figures. Such programmes should have use of arithmetic functions, data conversions, filtering from lists.
2) Parametric Programming (minimum two on each) such as
   a) Program to draw a standard machine component by using decision-making and looping statement of Autolisp.
   b) Program to draw a profile, generated after getting the data from user such as profile of cam, profile of gear tooth, profile of points present on moving links or mechanisms etc.
3) One innovative programmes for to draw an animated mechanism by using Autolisp programming (mechanisms such as slider crank, four bar, cam- follower etc.) Innovative programmes of any other type by using Autolisp environment.

Course Outcomes:

- Students will be able to effectively utilize the knowledge of various ISO standards obtained in theory while attaining practical.
- Students will be able to use various standards, symbols, tolerances, limits and fits while drawing the sheets.
- Students will be able to effectively communicate using software like AutoCAD and AutoLISP.

ME 209 Strength of Materials Laboratory

Teaching Scheme:
Practical: 2 hrs/week

Examination Scheme:
100 marks: Term work - 50,
Practical and Oral- 50

List of Experiments:
1. Tension test on Mild Steel and Aluminum
2. Shear test on Mild Steel and Aluminum
3. Torsion test on Mild Steel and Cast-Iron
4. Impact test on Mild Steel, Aluminum and Cast-Iron
5. Hardness test on Mild Steel, Aluminum and Cast iron
Course Outcomes:

- Students will be able to effectively utilize the knowledge obtained in theory in order to perform practical.
- Students will understand the effect of tensile, shearing force and can utilize the knowledge gained while tackling real life engineering problems.
- Students will be able to effectively incorporate the important concepts learnt while designing components.

PE 209 Manufacturing Engineering - I Laboratory

Teaching Scheme:
Practical: 2 hrs/week

Examination Scheme:
100 marks: Term work - 50,
Practical and Oral - 50

Term work:
1. Demonstration of various hand tools used in workshop
2. Visit to a factory to study the various foundry and foundry related operations
3. Fabrication of a job involving turning, drilling, milling and welding (One or two jobs)

Course Outcome:

- Students will be able to effectively utilize the knowledge obtained about various machine tools to perform practical.
- Students can effectively utilize various joining processes for addressing various mechanical engineering problems.
- Students can use knowledge obtained through hands on training towards successfully completion of their final year project.

AS 202 APPLIED BIOLOGY

Teaching Scheme
Lectures: 3 hrs/week
Tutorial: ----

Examination Scheme
100 marks: Continuous evaluation-
Assignments /Quiz- 40 Marks,
End - Sem Exam – 60 Marks

Unit 1 (6 Hrs)

Development of cell theory. Cell types: prokaryotes and. eukaryotes; cell organelles, single cell to multi-cellular organism, tissue and organ level organization, organ systems

(4 Hrs)
Structure of the cell membrane. Fluid mosaic model. Functions of plasma membrane; diffusion, osmosis, membrane transport through plasma membrane, ion channels and electrical properties (2 Hrs)

**Unit 2** (6 Hrs)

Energy Transduction and Bioenergetics. Mitochondria, ATP, Chemiosmosis, ATPase, Cell to cell junction-gap junctions. Ultra structure of Chloroplast, photosynthetic electron transport, Calvin cycle (2 Hrs)
Cell architecture, cyto-skeletal components, microtubules and microfilaments, motility and motor motions, actomyosin (2 Hrs)
Genomics and proteomics (2 Hrs)

**Unit 3** (8 Hrs)

Evolution of biological machines- Optimization of biological machines at different levels- molecular, cellular, organismal and populational; principles of generating diverse body plans and design in nature (4 Hrs)
Biomaterials. Applications of nanotechnology in biology. Biosensors & their application (4 Hrs)

**Unit 4** (6 Hrs)

Bioengineering- genetic engineering, protein engineering, tissue engineering and biochemical engineering. (4 Hrs)
Computational biology and bioinformatics (2 Hrs)

**Unit 5** (8 Hrs)

Biomechanics - fluid mechanics, examples in living world, aerodynamic, hydrodynamic and locomotion, mechanism of motion, friction and fracture. (4 Hrs)
Application of biomechanics and biomaterials- Human body motion, use of prosthetics, rehabilitation application (4 Hrs)

**Unit 6** (6 Hrs)

Instrumentation in biology- spectroscopic methods, bioimaging using various techniques e.g. MRI, CT scan etc. (4 Hrs)
Green environment- use of biotechnology in environmental engineering (2 Hrs)
(Entire course should be taught at introductory level)

**References :**

- Molecular Biology of Cell by Alberts.
- Biochemistry of Cell by Lehninger
- Plant Physiology by N.K.Sinha & Pandye
- Genes 8 by Benjamin Lewin
- A Text Book of Environmental Engineering by P. Venugopal Rao
- Animal Tissue Culture by Ian Freshlly
**Course Outcome:**

Students will be
- conversant with basic biology regarding origin of life, cell structures, bio-molecules, membrane transport & so on.
- Able to give knowledge about latest studies in biology like genetic & tissue engineering, stem cells, biomechanics, bioimaging, bio-nanotechnology etc.
- able to think what an engineer's role in life sciences is.

**ME 202 Theory of Machines- I**

**Teaching Scheme**
Lectures : 3 hrs/week
Tutorial : ----

**Examination Scheme**
100 marks: Continuous evaluation-
Assignments /Quiz- 40 Marks,
End - Sem Exam – 60 Marks

**Unit 1**
(6 hrs)

**Fundamentals of kinematics and mechanisms:**
Definition of link, Pair, chain structures, mechanisms, machine, inversion of four bar chains, single and double slider crank chain, equivalent linkage of mechanism. Degrees of freedom, Grubler’s criteria, straight line mechanism, pantograph, Geneva mechanism, steering gear mechanisms, Hooke’s joint.Introduction to compliant mechanism

**Unit 2**
(7 hrs)

**Velocity and acceleration analysis:**
Relative velocity acceleration methods, Corioli’s component of acceleration, instantaneous center of velocity, Kennedy theorem of three center in line, body and space centrode, velocity and acceleration in slider crank mechanism b analytical methods and Klein’s construction.

**Unit 3**
(6 hrs)

**Static and dynamic force analysis.**
Static force analysis of slider crank mechanism, D’Alembert’s principle, methods of finding inertia of rigid bodies, compound pendulum, bifilar and trifilar suspension methods, inertia forces in engine mechanisms analytical and graphical methods, dynamically equivalent system, correction couple, inertia of geared system.

**Unit 4**
(6 hrs)

**Theory of Gears I:**
Classification. Spur gear: definition, terminology, fundamental law of toothed gearing, involute and cycloidal profile, conjugate action, contact ratio, minimum number of teeth, interference and under cutting. Helical gears: nomenclature, center distance, virtual number of teeth.
Unit 5  (7 hrs)

**Cams and followers:**
Types of cams and followers, types of follower motion, velocity and acceleration diagrams, cams with specified contours.

Unit 6  (7 hrs)

**Governor Mechanisms:**
Introduction, Types, Governor Effort and governor power, Controlling force analysis, sensitivity, stability, isochronisms and hunting, friction, insensitiveness

**Text Books:**
- Bevan Thomas, “The Theory of Machines”, CBS publishers and distributors

**Reference Books:**
- Ramamurthy, V., “Mechanisms of Machines”, Narosa Publishing House

**Course Outcomes:**
- Students will demonstrate knowledge of various mechanisms in order to design and analyze mechanisms
- Students will demonstrate ability towards graphically estimating velocity and acceleration.
- Students will exhibit skills towards application of principles of static and dynamics force analysis.
- Knowledge attained will comply towards successfully addressing issues relating to gears, governors, cams and followers.

**ME 204  Fluid Mechanics**

**Teaching Scheme**
Lectures : 3 hrs/week
Tutorial : ----

**Examination Scheme**
100 marks: Continuous evaluation-
Assignments /Quiz- 40 Marks,
End - Sem Exam – 60 Marks

Unit 1  (7 hrs)

**Basics:**
Definition of fluid, fluid properties such as viscosity, vapour pressure, compressibility, surface
tension, capillarity, Mach number etc, pressure at a point in the static mass of fluid, variation of pressure, Pascal’s law, pressure measurement by simple and differential manometers using manometric expression.

Unit 2  
(7 hrs)

**Fluid Static:**
Hydrostatic forces on the plane and curved surfaces, centre of pressure, Buoyancy, centre of buoyancy, stability of floating bodies, metacentre and metacentric height its application in shipping.

Unit 3  
(8 hrs)

**Fluid Kinematics:**
Velocity of fluid particle, types of fluid flow, description of flow, continuity equation, Coordinate free form, acceleration of fluid particle, rotational & irrotational flow, Circulation and vorticity, Laplace’s equation in velocity potential and Poisson’s equation in stream function, flow net.

Unit 4  
(8 hrs)

**Fluid Dynamics:**
Momentum equation, development of Euler’s equation, Introduction to Navier-Stokes equation, Integration of Euler’s equation to obtain Bernoulli’s equation, Bernoulli’s theorem, Application of Bernoulli’s theorem such as venture meter, orifice meter, rectangular and triangular notch, pitot tube, orifices etc.

Unit 5  
(8 hrs)

a) **Laminar Flow:**
Flow through circular pipe, between parallel plates, Power absorbed in viscous flow in bearings, loss of head due to friction in viscous flow.

b) **Turbulent Flow:**
Reynolds’s experiment, frictional loss in pipe flow, shear stress in turbulent flow, major and minor losses, HGL and TEL, flow through series and parallel pipes.

Unit 6  
(7 hrs)

a) **Dimensional Analysis:**
Dimensional homogeneity, Raleigh’s method, Buckingham’s theorem, Model analysis, similarity laws and dimensionless numbers.

b) **Introduction** to boundary layer theory and its analysis.

c) **Forces on Submerged bodies:**
Drag, lift, Drag on cylinder, Development of lift in cylinder.

**Text Books:**

- Dr. P.N. Modi and Dr. S.M. Seth, “Hydraulics and Fluid Mechanics including Hydraulic Machines”, Standard Book House
• Dr. R.K. Bansal, “Fluid Mechanics and Hydraulic Machines - I”, Laxmi Publication Pvt. Ltd., New Delhi

**Reference Books:**

- Murlidhar, “Advanced Fluid Engineering”, Narosa Publication

**Course Outcomes:**

- Student will be able to understand the significance of properties of fluid.
- Student will be able to apply the knowledge of fluid statics, kinematics and dynamics while addressing problems of mechanical and chemical engineering
- Student will be able to estimate the discharge through a pipe or open channel.
- Student will be able to deal with practical problems in design of channels, openings and ships.
- Student can develop a dimensionless number by grouping number of dependent and independent variables and establish a relationship between input and output parameters.

**PE 204 Manufacturing Engineering - II**

**Teaching Scheme**
- **Lectures**: 3 hrs/week
- **Tutorial**: ----

**Examination Scheme**
- 100 marks: Continuous evaluation-
  - Assignments /Quiz: 40 Marks,
  - End - Sem Exam: 60 Marks

**Unit 1**

**Non-Conventional Machining-I:**
Introduction, Classification. Introduction, Principle, Working and Applications of Chemical Machining, Electrochemical Machining, Abrasive Jet Machining, Ultrasonic Machining.

**Unit 2**

**Non-Conventional Machining-II:**
Introduction, Principle, Working and Applications of Electric Discharge Machining, Electron Beam Machining, Ion Beam Machining, Plasma Arch Machining, Laser Machining- Cutting and Welding

**Unit 3**

**Theory of Metal Cutting:**
Cutting tools, tool geometry, concept of speed, feed, depth of cut, cutting action, cutting
forces, estimation of cutting forces, Merchants circle of forces, Measurement of cutting forces & power required, machinability, tool life.

Unit 4 (6 hrs)

Surface Treatment Processes:
Need of surface treatment, various surface treatment processes, Electroplating, phosphating, metal spraying, anodising etc. Surface Hardening processes, Effects of surface treatment processes.

Unit 5 (7 hrs)

Design of Jigs and Fixtures:
Definition, elements, Types of location, their selection, clamping. Types of Jig bushes, indexing methods. Types of Jigs & fixtures, Design of Jigs & fixtures, fabrication methods, costing, Economic aspect of tool design.

Unit 6 (7 hrs)

Gear Manufacturing:
Gear Geometry, Gear cutting process- forming and generation, gear cutting, milling, hobbing, gear shaping, shaving, lapping, grinding.

Introduction to Numerical Control & Machining Centres:
Introduction to NC, CNC, DNC machines, comparison with conventional machine tools, Basic principles of NC machines, Advantages and Disadvantages.

Text books:
- R. K. Jain, “Production technology”, Khanna Publications
- Hoffman, “Introduction to Jigs and Fixtures”, Galgotia Publishers

Reference Books:
- P. C. Sharma, “Production Engineering”, Khanna Publications
- Doyle, “Manufacturing Processes and Materials for engineers”, Prentice Hall of India Press

Course Outcomes:
- Students are exposed to various non conventional manufacturing processes and are able to understand the influence of process parameters significantly affecting them.
Developing competency in order to select appropriate machining process depending upon desired output characteristics such as MRR, surface finish, and integrity etc.,

Will be able to select/suggest non conventional machining process/ processes required for a component manufacturing.

Students will gain knowledge of component manufacturing at optimum cost.

This subject enables the student to understand various non conventional manufacturing processes and can apply the knowledge in engineering applications.

**MT 218 Material Science and Technology**

**Teaching Scheme**
- Lectures: 3 hrs/week
- Tutorial: ----

**Examination Scheme**
- 100 marks: Continuous evaluation-
- Assignments /Quiz: 40 Marks,
- End - Sem Exam – 60 Marks

**Unit 1**  
6 hrs

**Engineering Steels:**

**Unit 2**  
6 hrs

**Alloy Steels:**
Classification and applications of steels, specifications of some commonly used steels for engineering applications (e.g. En, DIN, IS etc. with examples). Effects of alloying elements. Classification of alloying elements. Examples of alloy steels. Stainless steels. Tool steels and tool materials.

**Unit 3**  
11 hrs

**Heat Treatment of Steels:**

**Unit 4**  
5 hrs

**Cast Irons:**
Classification of Cast irons Gray cast irons, nodular cast irons, white cast irons, malleable cast irons, chilled. Effect of various parameters on structure and properties of cast irons. Applications of cast irons for different components of machine tools, automobiles, pumps, etc.
Unit 5  
(8 hrs)

**Mechanical Testing:**

**Unit 6**  
(8 hrs)

**Non Destructive Testing:**
Magnaflux, dye penetrant, ultrasonic tests, radiography and eddy current testing.

**Pyrometry:**

**Powder Metallurgy and Advance Materials:**
Concept, Basic Procedure, Application, Merits & Demerits

**Text Books:**
- Askland & Phule, “Material science & Engineering of materials”, Thomson Learning

**Reference Books:**
- W. Callister, “Materials Science & Engineering”, Wiley

**Course Outcomes:**
- Able to demonstrate an understanding of the structure-deformation behaviour correlation in Engineering materials.
- Able to identify and select various materials for designing any part while carrying out project work.
- Able to apply knowledge gathered in applications related to never emerging materials in the industry.
- Able to effectively apply various testing methods while estimating output characteristics.
ME 206  Theory of Machines- 1 Laboratory

Teaching Scheme:  
Practical: 2 hrs/week

Examination Scheme:  
100 marks: Term work - 50,  
Practical and Oral- 50

List of Experiments:
1. Determination of moment of inertia of rigid bodies by bifilar/trifilar suspension methods.
2. Compound pendulum.
3. Experimental verification of displacement relation for different shaft angles for single Hooke’s joint.
4. To draw conjugate tooth profile for any shape of gear tooth.
5. To generate gear tooth profile and to study the effect of under cutting and rack shift using model.
6. To determine the characteristics curve of any two type of centrifugal governor and to find its coefficient of insensitiveness and stability.

List of Assignments:
1. Analytical determination of inertia forces in engine mechanisms.
2. Problem on steering gear mechanism.

List of Drawing Sheets:
1. Graphical solution to problems on velocity acceleration in mechanism by relative velocity and acceleration method including problem with Corioli’s component of acceleration.
2. Velocity by instantaneous center method.
3. Klein’s construction for slider cranks mechanisms.
4. Inertia forces analysis with graphical method.
5. To draw cam profile for various types of followers motion.

Course Outcomes:
- Students will demonstrate knowledge of various mechanisms in order to design and analyze mechanisms essential in mechanical engineering.
- Students will demonstrate ability towards graphically estimating velocity and acceleration.
- Students will exhibit skills towards application of principles of static and dynamics force analysis.
- Knowledge attained will comply towards successfully addressing issues relating to gears, governors, cams and followers in real life engineering problems.
ME 208  Fluid Mechanics Laboratory

Teaching Scheme:  Examination Scheme:
Practical: 2 hrs/week  100 marks: Term work - 50,

Candidates should conduct at least eight practical among the following in the laboratory and submit the report of their work as term work.

List of Experiments:

1. Determination of viscosity using redwood viscometer.
2. Study of manometers and the demonstration of the same in the laboratory.
3. Determination of metacentric height of a floating body.
5. Calibration of venturimeter or orifice meter.
7. Determination of friction factor for flow through pipe.
8. Verification of Bernoulli’s Theorem.
9. Calibration of V-notch or rectangular notch.
10. Study of minor losses in the flow system.

Course Outcomes:

- The student will be able to effectively apply the practical knowledge obtained in various mechanical engineering problems.
- The student will be competent to estimate various flow related parameters.
- The student can effectively apply the knowledge obtained regarding flow pattern.

PE 206  Manufacturing Engineering- II Laboratory

Teaching Scheme:  Examination Scheme:
Practical: 2 hrs/week  100 marks: Term work - 50,

Each candidate shall be required to complete and submit the following term work.

Part A

One composite job consisting of at least one spur gear to be made by each student.
Part B

Demonstration of any one non-conventional machining for manufacture of simple components.

Part C

A journal consisting of:
1. Design of a jig or fixture. (No fabrication).
2. A report of visit to any surface treatment industry.

Course Outcome:

- Students will apply knowledge of WEMD to the given job.
- Student will perform job on CNC machine by using CNC programming.
- Student will make a job of spur gear.

MT 220  Material Science and Technology  Laboratory

Teaching Scheme:  
Practical: 2 hrs/week

Examination Scheme:  
100 marks: Term work - 50, Practical and Oral- 50

Term work:
1. Study of effect of a heat treatment process on tensile strength of a sample, e.g. Mild steel.
2. Study of effect of a heat treatment process on hardness of a test sample, e.g. Mild steel.
3. Study of effect of a heat treatment process on Impact strength of a test sample, e.g. Mild Steel.
4. Non-Destructive tests: Magnaflux testing, Dye penetrant testing and Ultrasonic testing.
5. Study and drawing of microstructures of mild steel, medium carbon steel, eutectoid steel and hypereutectoid steel.
7. Study and drawing of microstructures of white malleable, gray and nodular cast irons.
8. Study and drawing of microstructures of hardened steel, tempered steel.

Course Outcomes:

- Able to demonstrate an understanding of the structure-deformation behaviour correlation in engineering materials.
- Able to identify and select various materials for designing any part while carrying out project work.
- Able to apply knowledge gathered in applications related to never emerging materials in the industry.
- Able to effectively apply various testing methods while estimating output characteristics.
AS 204 Professional Communication

Teaching Scheme
Lectures: 2 hrs/week
Tutorial:

Examination Scheme
100 marks: Continuous evaluation-
Assignments /Quiz: 40 Marks,
End - Sem Exam – 60 Marks

The coverage of soft skills that help develop a student as a team member, leader, all round professional in the long run have been identified and listed here for reference. As the time allotment for the soft skills laboratory is small and the fact that these skills are nurtured over years, students are encouraged to follow up on these skills as self-study and self driven process.

Unit 1
(8 hrs)

Verbal and Nonverbal Spoken Communications: Public speaking, Group discussions, Oral Presentation skills, Perfect interview, listening and Observation skills, Body language, Use of presentation graphics, Use of presentation aids, study of Communication barriers.

Unit 2
(8 hrs)


Unit 3
(8 hrs)

Leadership Skills and Interpersonal Communications: Leaders: their skills, roles, and responsibilities. Vision, Empowering and delegation, motivating others, organizational skills, Problem solving and conflict management, team building, interpersonal skills. Organizing and conducting meetings, decision making, giving support, Exposure to work environment and culture in today’s job places, improving personal memory, Study skills that include Rapid Reading, Notes Taking, Self learning, Complex problem solving and creativity. Business Ethics, Etiquettes in social as well as office settings, E-Mail Etiquettes, Telephone Etiquettes, Engineering Ethics and Ethics as an IT Professional, Civic Sense.

Reference Books:

- Raman, Sharma, “Technical Communications”, OXFORD.
List of Possible Assignments
1. Write a Personal essay and or resume or statement of purpose which may include:
   a. Who am I (family background, past achievements, past activities of significance).
   b. Strengths and weaknesses (how to tackle them) (SWOT analysis).
   c. Personal short-term goals, long-term goals and action plan to achieve them.
   d. Self assessment on soft skills.
2. Students could review and present to a group from following ideas:
   a. Presentation of a technical report.
   b. Biographical sketch.
   c. Any topic such as an inspirational story/personal values/beliefs/current topic.
   d. Ethics and etiquettes and social responsibilities as a professional.
3. Students will present to a group from following ideas:
   e. Multimedia based oral presentation on any topic of choice (Business/Technical).
   f. Public speaking exercise in form of debate or elocution on any topic of choice.
4. Students will undergo two activities related to verbal/nonverbal skills from following:
   a. Appearing for mock personal interviews.
   b. Participating in group discussions on current affairs/social issues/ethics and etiquettes.
   c. Participating in Games, role playing exercises to highlight nonverbal skills.
5. Students will submit one written technical documents from following:
   a. Project proposal.
6. Students will submit one written business documents from following:
   a. A representative Official correspondence.
   b. Minutes of meeting.
   c. Work progress report.
   d. Purchase order checklist for event management etc.
7. Students will participate in one or two activities from following:
   a. Team games for team building.
   b. Situational games for role playing as leaders, members.
   c. Organizing mock events.
   d. Conducting meetings.

Course Outcomes:

It will
• encourage the all round development of students by focusing on soft skills.
• make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice
• make the engineering students aware of the importance, the role and the content of the soft skills through instruction, knowledge acquisition, demonstration and practice.
• develop and nurture the soft skills of the students through individual and group activities.
• expose students to right attitudinal and behavioral aspects, and to build the same through activities.
ML202 Environmental Studies

**Teaching Scheme**
Lectures: 2 hrs/week
Tutorial:

**Examination Scheme**
100 marks: Continuous evaluation
Assignments/Quiz: 40 Marks,
End - Sem Exam – 60 Marks

**Unit 1** (04)
Multidisciplinary nature of environmental studies: Definition, scope and importance, need for public awareness.

**Unit 2** (06)
Natural Resources:
Renewable and non-renewable resources: Natural resources and associated problems.
Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

**Unit 3** (04)
Biodiversity and its conservation: Introduction - Definition: genetic, species and ecosystem diversity, Biogeographically classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.

**Unit 4** (06)
Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management.

**Unit 5** (06)
Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns.

**Text Books:**
• De A.K, “Environmental Chemistry”, Wiley Eastern Ltd.

Reference Books
• Bharucha Erach, “The Biodiversity of India” Mapin Publishing Pvt. Ltd., Ahmedabad -380 013, India, Email: mapin@icenet.net

MA 203 Foundations of Mathematics I

Teaching Scheme
Teaching Scheme
Lectures : 3 hrs/week
Tutorial : 1 hr/week

Examination Scheme
100 marks: Continuous evaluation-
Assignments /Quiz- 40 Marks,
End - Sem Exam – 60 Marks

Unit 1 (8 hrs)
Applications Of Derivatives: Extreme values of functions, Rolle’s theorem, proof, graphical representation and examples, Mean value theorem, proof, applications, examples, CMVT proof with consequences, Monotonic function with first derivative test and problems, Indeterminate forms, L’Hospitals Rule, Types of problems on Indeterminate form.

Unit 2 (8 hrs)
Partial Differentiation and Its Applications: Functions of several variables, Limits & continuity: Introduction, Partial derivative, Chain rule, Implicit function, Total derivative, Maxima and minima of the functions of two variables, Lagrange’s method of multipliers, applications

Unit 3 (4 hrs)
Eigen values and Basics of Eigen vectors, examples

Unit 4 (4 hrs)
Review and some new techniques of integration: Reduction formulae, Beta & Gamma functions with Properties(without proofs), Differentiation under the Integral sign (both rules (without proofs) with examples).

Unit 5 (8 hrs)
Double Integrals: Double integrals, Examples( Areas, Moments, Center of Mass), Change of order of integration with examples, Double integrals in Polar form.

Unit 6 (8 hrs)
**Triple Integrals:** Triple integrals in rectangular coordinates, Masses and moments in three dimensions, Triple integrals in spherical and cylindrical coordinates, examples.

**Text Books:**


**Reference Books:**


**Course outcomes:**

Students will be

- Able to think logically
- Understand the basic concepts and applications of derivatives, ordinary as well as partial, in solving engineering problems
- Use multiple integrals in order to obtain solutions for engineering problems.

**MA 204  Foundations of Mathematics II**

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures : 3 hrs/week</td>
<td>100 marks: Continuous evaluation-</td>
</tr>
<tr>
<td>Tutorial : 1 hr/week</td>
<td>Assignments /Quiz- 40 Marks,</td>
</tr>
<tr>
<td></td>
<td>End - Sem Exam – 60 Marks</td>
</tr>
</tbody>
</table>

**Unit 1**  
(4 hrs)

**Gradient, Divergence and Curl:** Vector and Scalar functions and Fields, Derivatives, Gradient of a Scalar field, Directional derivatives, Divergence and Curl of a Vector field

**Unit 2**  
(5 hrs)

**Vector Integral Calculus:** Line Integrals, Line integrals independent of path, Green’s theorem in plane, surface integral, Divergence theorem and Stoke’s theorem
Unit 3
(8hrs)


Unit 4
(6 hrs)

Partial Differential Equations: Basic concepts, method of separation of variables, Concept of Fourier Series, One dimensional wave equation and one dimensional heat equation.

Unit 5
(10 hrs)

Laplace Transforms: Laplace Transform, Inverse Laplace Transform, linearity, shifting, transforms of derivatives and integrals, differential equations, differentiation and integration of transforms, convolution

Unit 6
(7 hrs)

Statistics: Random Variables, Probability Distributions, Mean and Variance of a distribution, binomial and normal distributions, testing of hypothesis.

Text Books:


Reference Books:


Course Outcomes:

At the end of the course students
- Able to think logically
- Understand the of vector calculus and its importance in solving engineering problems
• Able to model various engineering phenomenon through differential equations and apply methods to solve them.
• Understand the importance of statistics in order to obtain solutions to engineering problems.

AS 205 Foundations of Physics

Teaching Scheme
Lectures : 3 hrs/week
Tutorial : --

Examination Scheme
100 marks: Continuous evaluation-
Assignments /Quiz- 40 Marks,
End - Sem Exam – 60 Marks

Unit 1

Wave Mechanics:
Matter waves, De-Broglie’s concept of matter waves, Properties of matter waves, Davison and Germer Experiment, Heisenberg’s uncertainty principle and its experimental illustrations, Schrödinger’s time dependent and time independent equations, Eigen values and Eigen functions, Expectation values, Physical significance of wave function. Applications of Schrödinger’s equation: Motion of a free particle, Electron in an infinite deep potential well (rigid box), Electron in a finite deep potential well (non-rigid box).

Unit 2

Structure of Solids and its Characterization:
Crystalline state, space lattice, crystal structure basis and lattice, unit cell and primitive cell in two dimensional lattice, Miller indices, inter planer distance of lattice plane, crystal systems in brief (cubic, monoclinic...triclinic), atomic radius (simple cubic, fcc, bcc), no. of atoms in unit cell, coordination number, packing fraction, X-ray diffraction: Bragg’s law, X-ray spectrometer, analysis.

Unit 3

Solid state physics:
Free electron theory, Band theory of solids, Classification of solids on the basis of band theory, Fermi-Dirac probability function, Position of Fermi level in intrinsic semiconductor (with derivation), Temperature variation of carrier concentration in extrinsic semiconductors.

Unit 4

Semiconductor conductivity:
Electron and hole concentrations in intrinsic semiconductors, Intrinsic density, Intrinsic conductivity, Extrinsic conductivity, Law of mass action, Fermi level in extrinsic semiconductors, Electrical conduction in Extrinsic semiconductors, Diffusion length and mean life time, Hall Effect.
Unit 5

Semiconductor devices:
Formation of p-n junctions, position of Fermi level in equilibrium, forward and reverse bias, p-n junction diode: I-V characteristics in forward and reverse bias, Photodiode.

Unit 6

Magnetism and Superconductivity:
Origin of magnetic moment, Diamagnetism, Paramagnetism: Langevin's Theory, Ferromagnetism: Weiss Theory (Spontaneous magnetization and Domain hypothesis), Antiferromagnetism, Ferrimagnetism. Principle of superconductivity, Meissner effect, properties of superconductors, Type I and Type II superconductors.

References:
- Modern Physics – Jeremy Bernstein, Paul m. Fishbane, Stephen Gasiorowics; Pearson Education
- PHYSICS (Volume I & II) – Resnick Halliday and Krane; Willey India 5th Edition
- Solid State Physics – A. J. Dekkar; Mac Millan India Limited
- Solid State Physics - Niel W. Aschcroft & N. David Mermin; Thomson Books Cole
- Fundamentals of Magnetism- B. Cullity; Addison-Wesley Publishing
- Semiconductor devices, physics and technology - S. M. Sze; Wiley
- Solid State Physics – S. O. Pillai; New Age International
- Introduction to solid state physics - C. Kittel; Wiley

Course Outcomes:

The student is expected to:
- Motion in central force field, properties of central force field, its equation of motion
- Explain the applications of Optics
- Understand Concept of electric Field and Electric Potential
- Understand Amperes law and its applications
- Understand Laws of Thermodynamics and day to day life applications
- Understand origin of Quantum Mechanics
LL201- Liberal Learning Course

Teaching Scheme  Examination Scheme
Theory: 1-hrs/Week  Presentation: 50 marks

Annexure-II: List of Liberal Learning courses offered at Institute level

- **Agricultural** - Animal Science Forestry Horticulture Floriculture Sustainable Agriculture Veterinary
- **Arts** - Graphic Design Interior Design Fashion Design
- **Basic Sciences** - Astronomy Astro- physics Biology Genetics Kinesiology Micro- biology Neuro- science
- **Business** - Administration Communication Entrepreneurial studies Hotel Management Marketing
- **Defense Studies** - Military Studies Naval Studies Air force studies War strategies
- **Education** - Education policies Engineering Education Teacher Training
- **Environmental Sciences** Ecology Meteorology
- **Linguistics** Word Language
- **Medicine** Health Studies Nutrition and dietetics
- **Performing Arts** Music Dance Theatre Cinema
- **Philosophy** Religious Studies
- **Sports and Athletics**

Course Outcome:

- Students learn new topics from various disciplines on their own without any teaching or tutoring.
- Students understand qualitative attributes of good learner.
- Students understand quantitative measurements of learning approaches and learning styles.
- Students understand various sources and avenues to harvest information.
- Students assess themselves at various stages of learning.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title of the course</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG001/VIT</td>
<td>English Proficiency Test</td>
</tr>
<tr>
<td>ENG101</td>
<td>None</td>
</tr>
<tr>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

Effective English*  
English for Engineers-II  
Foreign Language  
Environmental Studies*  
Computer Programming and Problem Solving*  
Multivariable calculus and Differential Equations*  
Modern Physics*  
Engineering Chemistry.