1. Vision, Mission and Objectives

1.1 The Vision of the Institute is “To make every man a success and no man a failure”.

In order to progress towards the vision, the Institute has identified itself with a mission to provide every individual with a conducive environment suitable to achieve his / her career goals, with a strong emphasis on personality development, and to offer quality education in all spheres of engineering, technology, applied sciences and management, without compromising on the quality and code of ethics.

1.2 Further, the Institute always strives

- To train our students with the latest and the best in the rapidly changing fields of Engineering, Technology, Management, Science & Humanities.

- To develop the students with a global outlook possessing, state of the art skills, capable of taking up challenging responsibilities in the respective fields.

- To mould our students as citizens with moral, ethical and social values so as to fulfill their obligations to the nation and the society.

- To promote research in the field of Science, Humanities, Engineering, Technology and allied branches.

1.3 Aims and Objectives of the Institute are focused on

- Providing world class education in engineering, technology, applied sciences and management.

- Keeping pace with the ever changing technological scenario to help the students to gain proper direction to emerge as competent professionals fully aware of their commitment to the society and nation.

- To inculcate a flair for research, development and entrepreneurship.

2. Admission

2.1. The admission policy and procedure shall be decided from time to time by the Board of Management (BOM) of the Institute, following guidelines issued by Ministry of Human Resource Development (MHRD), Government of India. The number of seats in each branch of the B.Tech programme will be decided by BOM as per the directives from MHRD, Government of India and taking into account the market demands. Some seats for Non Resident Indians and a few seats for foreign nationals shall be made available.

2.2. (i) Full-Time:

At the time of applying for admission, the candidates should have passed / appeared and be awaiting results of the final examination of the 10+2 system or its equivalent with Mathematics, Physics and Chemistry as subjects of study.

(ii) Part -Time:

At the time of applying for admission, the candidates should have a Diploma in Engineering/Technology in the relevant branch of specialization awarded by the State Board of Technical Education, Tamil Nadu or any other authority accepted by the Board of Management of the University as equivalent there to and a minimum of one year practical experience.

2.3. The selected candidates will be admitted to the B.Tech. programme after he/she fulfills all the admission requirements set by the Institute and after the payment of the prescribed fees.

2.4. In all matters relating to admission to the B.E. / B.Tech. programme, the decision of the Institute and its interpretation given by the Chancellor of the Institute shall be final.

2.5. If at any time after admission, it is found that a candidate has not fulfilled any of the requirements stipulated by the Institute, the Institute may revoke the admission of the candidate with information to the Academic Council.

3. Structure of the programme

3.1. The programme of instruction will have the following structure:

i) A general (common) core programme comprising basic sciences, engineering
ii) An engineering core programme introducing the student to the foundations of engineering in the respective branch.

iii) An elective programme enabling the student to opt and undergo a set of courses of interest to him/ her.

iv) Professional practice including project, seminar and industrial training.

v) General elective courses, such as, Environmental Studies, Physical Education, Professional ethics, and National Service Scheme.

The distribution of total credits required for the degree programme into the above five categories will nominally be 20%, 50%, 15%, 5%, and 10% respectively.

3.2.(i) Full-Time:
The duration of the programme will be a minimum of 8 semesters. Every branch of the B.E. / B.Tech. programme will have a curriculum and syllabi for the courses approved by the Academic Council.

(ii) Part-Time:
The duration of the programme will be a minimum of 7 semesters. Every branch of the B.Tech. programme will have a curriculum and syllabi for the courses approved by the Academic Council.

3.3 The academic programmes of the Institute follow the credit system. The general pattern is:
- One credit for each lecture hour per week per semester;
- One credit for each tutorial hour per week per semester;
- Two credit for each laboratory practical/drawing of three hours per week per semester.
- One credit for 4 weeks of industrial training
- One credit for 4 hours of project per week per semester.

3.4. (i) Full-Time:
For the award of degree, a student has to earn certain minimum total number of credits specified in the curriculum of the relevant branch of study. The curriculum of the different programs shall be so designed that the minimum prescribed credits required for the award of the degree shall be within the limits of 190-200.

(ii) Part-Time:
For the award of degree, a student has to earn certain minimum total number of credits specified in the curriculum of the relevant branch of study. The curriculum of the different programs shall be so designed that the minimum prescribed credits required for the award of the degree shall be within the limits of 110-120.

3.5. The medium of instruction, examination and the language of the project reports will be English.

4. Faculty Advisor

4.1. To help the students in planning their courses of study and for getting general advice on the academic programme, the concerned Department will assign a certain number of students to a Faculty member who will be called their Faculty Advisor.

5. Class Committee

5.1 A Class Committee consisting of the following will be constituted by the Head of the Department for each class:

(i) A Chairman, who is not teaching the class.

(ii) All subject teachers of the class.

(iii) Two students nominated by the department in consultation with the class.

The Class Committee will meet as often as necessary, but not less than three times during a semester.

The functions of the Class Committee will include:

(i) Addressing problems experienced by students in the classroom and the laboratories.

(ii) Analyzing the performance of the students of the class after each test and finding ways and means of addressing problems, if any.

(iv) During the meetings, the student members shall express the opinions
6. Grading

6.1 A grading system as below will be adhered to.

6.2 GPA and CGPA

GPA is the ratio of the sum of the product of the number of credits $C_i$ of course “i” and the grade points $P_i$ earned for that course taken over all courses “i” registered by the student to the sum of $C_i$ for all “i”. That is,

$$GPA = \frac{\sum C_i P_i}{\sum C_i}$$

CGPA will be calculated in a similar manner, at any semester, considering all the courses enrolled from the first semester onwards.

6.3. For the students with letter grade I in certain subjects, the same will not be included in the computation of GPA and CGPA until after those grades are converted to the regular grades.

6.4 Raw marks will be moderated by a moderation board appointed by the Vice Chancellor of the University. The final marks will be graded using an absolute grading system. The Constitution and composition of the moderation board will be dealt with separately.

7. Registration and Enrolment

7.1 Except for the first semester, registration and enrollment will be done in the beginning of the semester as per the schedule announced by the University.

7.2 A student will be eligible for enrollment only if he/she satisfies regulation 10 (maximum duration of the programme) and will be permitted to enroll if (i) he/she has cleared all dues in the Institute, Hostel and Library up to the end of the previous semester and (ii) he/she is not debarred from enrollment by a disciplinary action of the University.

7.3. Students are required to submit registration form duly filled in.

8. Registration requirement

8.1.(i). Full -Time:
A full time student shall not register for less than 16 credits or more than 30 credits in any given semester.

(ii). Part -Time:
A part time student shall not register for less than 10 credits or more than 20 credits in any given semester

<table>
<thead>
<tr>
<th>Range of Marks</th>
<th>Letter Grade</th>
<th>Grade points</th>
</tr>
</thead>
<tbody>
<tr>
<td>95-100</td>
<td>S</td>
<td>10</td>
</tr>
<tr>
<td>85-94</td>
<td>A</td>
<td>09</td>
</tr>
<tr>
<td>75-84</td>
<td>B</td>
<td>08</td>
</tr>
<tr>
<td>65-74</td>
<td>C</td>
<td>07</td>
</tr>
<tr>
<td>55-64</td>
<td>D</td>
<td>06</td>
</tr>
<tr>
<td>50-54</td>
<td>E</td>
<td>05</td>
</tr>
<tr>
<td>&lt; 50</td>
<td>U</td>
<td>00</td>
</tr>
</tbody>
</table>

8.2 If a student finds his/her load heavy in any semester, or for any other valid reason, he/she may withdraw from the courses within three weeks of the commencement of the semester with the written approval of his/her Faculty Advisor and HOD. However the student should ensure that the total number of credits registered for in any semester should enable him/her to earn the minimum number of credits per semester for the completed semesters.

9. Continuation of the programme

9.1 For those students who have not earned the minimum required credit prescribed for that particular semester examination, a warning letter to the concerned student and also to his/her parents regarding the shortage of his/her credit will be sent by the HOD after the announcement of the results of the university examinations.

10. Maximum duration of the programme

10.1.(i) Full - Time
The normal duration of the programme is eight semesters. However a student may complete the programme at a slower pace by
taking more time, but in any case not more than 14 semesters excluding the semesters withdrawn on medical grounds or other valid reasons.

(ii) Part - Time
The normal duration of the programme is seven semesters. However a student may complete the programme at a slower pace by taking more time, but in any case not more than 12 semesters excluding the semesters withdrawn on medical grounds or other valid reasons

11. Temporary discontinuation

11.1. A student may be permitted by the Director (Academic) to discontinue temporarily from the programme for a semester or a longer period for reasons of ill health or other valid reasons. Normally a student will be permitted to discontinue from the programme only for a maximum duration of two semesters.

12. Discipline

12.1. Every student is required to observe discipline and decorum both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the University.

12.2. Any act of indiscipline of a student reported to the Director (Academic) will be referred to a Discipline Committee so constituted. The Committee will enquire into the charges and decide on a suitable punishment if the charges are substantiated. The committee will also authorize the Director (Academic) to recommend to the Vice Chancellor the implementation of the decision. The student concerned may appeal to the Vice Chancellor whose decision will be final. The Director (Academic) will report the action taken at the next meeting of the Council.

12.3. Ragging and harassment of women are strictly prohibited in the University campus and hostels.

13. Attendance

13.1. A student whose attendance is less than 75% in a semester is not eligible to appear for the end – semester examination for that semester. The details of all students who have less than 75% attendance in a course will be announced by the teacher in the class. These details will be sent to the concerned HODs and Director (Academic).

13.2. Those who have less than 75% attendance will be considered for condonation of shortage of attendance. However, a condonation of 10% in attendance will be given on medical reasons. Application for condonation recommended by the Faculty Advisor, concerned faculty member and the HOD is to be submitted to the Director (Academic) who, depending on the merits of the case, may permit the student to appear for the end semester examination. A student will be eligible for this concession at most in two semesters during the entire degree programme. Application for medical leave, supported by medical certificate with endorsement by a Registered Medical Officer, should reach the HOD within seven days after returning from leave or, on or before the last instructional day of the semester, whichever is earlier.

13.3 As an incentive to those students who are involved in extra curricular activities such as representing the University in Sports and Games, Cultural Festivals, and Technical Festivals, NCC/ NSS events, a relaxation of up to 10% attendance will be given subject to the condition that these students take prior approval from the officer – in-charge. All such applications should be recommended by the concerned HOD and forwarded to Director (Academic) within seven instructional days after the programme / activity.

14. Assessment Procedure

14.1. The Academic Council will decide from time to time the system of tests and examinations in each subject in each semester.

14.2 For each theory course, the assessment will be done on a continuous basis as follows:

<table>
<thead>
<tr>
<th>Test / Exam</th>
<th>Weightage</th>
<th>Duration of Test / Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Periodical Test *</td>
<td>10%</td>
<td>2 Periods</td>
</tr>
<tr>
<td>Second Periodical Test *</td>
<td>10%</td>
<td>2 Periods</td>
</tr>
<tr>
<td>Model Exam</td>
<td>20%</td>
<td>3 hours</td>
</tr>
<tr>
<td>Seminar/ Assignments/Quiz</td>
<td>10%</td>
<td>-</td>
</tr>
</tbody>
</table>
Attendance

<table>
<thead>
<tr>
<th>Attendance</th>
<th>10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>End – semester examination</td>
<td>50%</td>
</tr>
</tbody>
</table>

*Best out of the two test will be considered.

14.3 For practical courses, the assessment will be done by the subject teachers as below:

(i) Weekly assignment/Observation note book / lab records – weightage 60%.
(ii) End semester examination of 3 hours duration including viva – weightage 40%.

14.4 For courses on Physical Education, NSS, etc the assessment will be as satisfactory/not satisfactory only.

15. Make up Examination/Model Exam

15.1. Students who miss the end-semester examinations / model examination for valid reasons are eligible for make-up examination /model examination. Those who miss the end-semester examination / model examination should apply to the Head of the Department concerned within five days after he/she missed examination, giving reasons for absence.

15.2. Permission to appear for make-up examination / model examination will be given under exceptional circumstances such as admission to a hospital due to illness. Students should produce a medical certificate issued by a Registered Medical Practitioner certifying that he/she was admitted to hospital during the period of examination / model exam and the same should be duly endorsed by parent / guardian and also by a medical officer of the University within 5 days.

16. Project evaluation

16.1 For Project work, the assessment will be done on a continuous basis as follows:

<table>
<thead>
<tr>
<th>Review / Examination</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Review</td>
<td>10%</td>
</tr>
<tr>
<td>Second Review</td>
<td>20%</td>
</tr>
<tr>
<td>Third Review</td>
<td>20%</td>
</tr>
<tr>
<td>End-semester Examination</td>
<td>50%</td>
</tr>
</tbody>
</table>

For end – semester examination, the student will submit a Project Report in a format specified by the Director (Academic). The first three reviews will be conducted by a Committee constituted by the Head of the Department. The end – semester examination will be conducted by a Committee constituted by the Registrar / Controller of examination. This will include an external expert.

17. Declaration of results

17.1.(i) A candidate who secures not less than 50% of total marks prescribed for a course with a minimum of 50% of the marks prescribed for the end semester examination shall be declared to have passed the course and earned the specified credits for the course.

(ii) To be Eligible to appear for the end semester examinations for a particular course, a candidate will have to secure a minimum of 40% marks in the sessional for that course.

(iii) Candidates are required to obtain all credits assigned to the first two semesters of the programme within the first four semesters of the programme. Candidates failing to satisfy this requirement will not be allowed to proceed to the fifth semester until the condition is satisfied. Further, candidates will not be allowed to proceed to seventh semester if they have not cleared all the courses assigned during third & fourth semesters.

17.2 After the valuation of the answer scripts, the tabulated results are to be scrutinized by the Result Passing Boards of UG programmes constituted by the Vice-Chancellor. The recommendations of the Result Passing Boards will be placed before the Standing Sub Committee of the Academic Council constituted by the Chancellor for scrutiny. The minutes of the Standing Sub Committee along with the results are to be placed before the Vice-Chancellor for approval. After getting the approval of the Vice-Chancellor, the results will be published by the Controller of Examination/Registrar.

17.3 If a candidate fails to secure a pass in a course due to not satisfying the minimum requirement in the end semester examination, he/she shall register and reappear for the end semester examination during the following semester. However, the sessional marks secured by the
candidate will be retained for all such attempts.

17.4 If a candidate fails to secure a pass in a course due to insufficient sessional marks though meeting the minimum requirements of the end semester examination, and wishes to improve on his/her sessional marks, he/she will have to register for the particular course and attend the course with permission of the HOD concerned and Director(Academic) with a copy marked to the Registrar. The sessional and external marks obtained by the candidate in this case will replace the earlier result.

17.5 A candidate can apply for the revaluation of his/her end semester examination answer paper in a theory course within 2 weeks from the declaration of the results, on payment of a prescribed fee through proper application to the Registrar/Controller of Examinations through the Head of the Department. The Registrar/Controller of Examination will arrange for the revaluation and the results will be intimated to the candidate concerned through the Head of the Department. Revaluation is not permitted for practical courses and for project work.

17.6 After ten semesters, the sessional marks of the candidate will not be considered for a pass in a course. A candidate who secures 50% in the end semester examination shall be declared to have passed the course and earned the specified credits for the course.

18. Grade Card

18.1 After results are declared, grade sheet will be issued to each student which will contain the following details:
(i) Program and branch for which the student has enrolled.
(ii) Semester of registration.
(iii) List of courses registered during the semester and the grade scored.
(iv) Semester Grade Point Average (GPA)
(v) Cumulative Grade Point Average (CGPA).

19. Class/Division

19.1 Classification is based on CGPA and is as follows:
6.5 ≤ CGPA < 8.0 : **First Class**
5.0 ≤ CGPA < 6.5 : **Second Class**.

19.2 (i) Further, the award of „First class with distinction“ is subject to the candidate becoming eligible for the award of the degree having passed the examination in all the courses in his/her first appearance within the minimum duration of the programme.

(ii) The award of „First Class“ is further subject to the candidate becoming eligible for the award of the degree having passed the examination in all the courses within 10 semesters.

(iii) The period of authorized discontinuation of the programme (vide clause 11.1) will not be counted for the purpose of the above classification.

20. Transfer of credits

20.1. Within the broad framework of these regulations, the Academic Council, based on the recommendation of the transfer of credits committee so consulted by the Chancellor may permit students to earn part of the credit requirement in other approved institutions of repute and status in the country or abroad.

20.2 The Academic Council may also approve admission of lateral entry (who hold a diploma in Engineering/ technology) candidates with advance credit based on the recommendation of the transfer of credits committee on a case to case basis.

21. Eligibility for the award of B.Tech. Degree

21.1. A student will be declared to be eligible for the award of the B.Tech. Degree if he/she has
i) registered and successfully acquired the credits for the core courses;
ii) successfully acquired the credits in the different categories as specified in the curriculum corresponding to the discipline (branch) of his/her study within the stipulated time;
iii) has no dues to all sections of the Institute including Hostels, and
iv) has no disciplinary action pending against him/her.
The award of the degree must be recommended by the Academic Council and approved by the Board of Management of the University.

22. Change of Branch

22.1 If the number of students in any branch of B.Tech. class as on the last instructional day of the First Semester is less than the sanctioned strength, then the vacancies in the said branches can be filled by transferring students from other branches. All such transfers will be allowed on the basis of merit of the students. The decision of the Chancellor shall be final while considering such requests.

22.2 All students who have successfully completed the first semester of the course will be eligible for consideration for change of branch subject to the availability of vacancies.

23. Power to modify

23.1. Notwithstanding all that has been stated above, the Academic Council shall modify any of the above regulations from time to time subject to approval by the Board of Management.
B. TECH. (AUTOMOBILE ENGINEERING – MOTORSPORT ENGINEERING)

With the growing popularity of racing in particular and motorsport in general in India, Hindustan University organized various events like quiz program and competitions on Motor sports and encourage students and faculty to take part in events that gives international exposure.

Automobile Engineering Department of Hindustan University is conducting programmes in Automobile Engineering (UG & PG) and Internal Combustion Engineering (PG). Since 2007, Faculty and Students are actively and successfully involved in design analysis and fabrication of Motor Sport Vehicles like All Terrain Vehicle (ATV), Formula Student Racing Vehicle etc., which further goes for participation at National and International Competitions. In view of developments, the department is introducing Motor Sport Engineering as specialization in Automobile Engineering as a UG Programme

The objective of this programme is to develop understanding of the principles, design & construction and working of Automobiles with specialization in Motorsport Engineering. The aim is to produce graduates with a broad understanding of all contextualized elements related to Motorsport environment. Graduates will be equipped to solve multidisciplinary problems and will be part of future developments in industry. It is anticipated that graduates from the course will play a major/lead role in design, management and coordination of multidisciplinary projects.

The scope of this program is to impart knowledge to graduating students on basics of Automobiles, understanding of mechanical analysis and design combined with awareness of Engineering Practices, Electronics, Information Technology, Project Management and Business issues related to Motorsport. Motorsport Engineering is the extreme engineering of Automobile that put the engineer and the motorsport vehicle to all sort of testing to be fit anywhere in the automobile industry.

Career prospects are expected to keep pace with continuing rapid advances leading to increased demand for competent and versatile graduates who can design and implement innovative solutions for the automobile industry in general and motorsport industry in particular. The course aims to enable students to meet this demand.

The salient features of this course will provide knowledge and improve skill-sets in

- The Basic Sciences in Engineering in the First year
- The Basics of Mechanical Engineering in the Third Semester
- The Basics of Automobile Engineering in the Fourth Semester
- Specialized courses in Motorsport Engineering like Overview of Motorsport Engineering, Racing Two Wheelers, Performance Tuning in Racing Engine, Motorsport Safety, Aerodynamic Racing Vehicle, Collegiate Design Series from Fifth Semester onwards.

The total duration of this program is 4 years (8 Semesters).
## Semester I
(Common to all branches)

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>TCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>EL 2101</td>
<td>Technical English</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>MA 2101</td>
<td>Engineering Mathematics – I</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>PH 2001</td>
<td>Engineering Physics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>ME 2101</td>
<td>Engineering Graphics</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td>CS 2101</td>
<td>Computer Programming</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

### Theory

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>TCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.</td>
<td>CS 2131</td>
<td>Computer Programming Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>GE2131</td>
<td>Engineering Practices Laboratory I</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>EL 2131</td>
<td>Communication Skills Laboratory I</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9.</td>
<td>PH 2031</td>
<td>Physics Laboratory</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

### Practical

Total 21 30

## Semester II

*Common to Auto, Mech. And MSE*
### Semester III

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>TCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>MS2301</td>
<td>Overview of Motorsport Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>MS2302</td>
<td>Engine Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>AT2302</td>
<td>Applied Thermodynamics*</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>ME2302</td>
<td>Fluid Mechanics **</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td>MS2303</td>
<td>Fuels and Lubricants</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>MS2311</td>
<td>Engine Testing Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>MS2312</td>
<td>Fluid Mechanics Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>MS2313</td>
<td>Fuels and Lubricants Lab</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9.</td>
<td>MS2314</td>
<td>Special Machines Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>25</td>
<td>29</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Common to Automobile Engineering  
**Common to Mechanical Engineering

### Semester IV

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>TCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>MS2401</td>
<td>Theory of Machines</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>MS2402</td>
<td>Vehicle Handling Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>MS2403</td>
<td>Drive Line Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>ME2402</td>
<td>Strength of Materials **</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td>MS2404</td>
<td>Materials for Motor Sport Application</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>MS2405</td>
<td>Transmission Drives</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>MS2411</td>
<td>Automotive Engines &amp; Chassis Components Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>MS2412</td>
<td>Reverse Engineering Lab-1#</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9.</td>
<td>MS2413</td>
<td>Mechanics of Materials and Metallurgy Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>26</td>
<td>29</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Common to Mechanical Engineering  
#Students should dismantle measure, draw and assemble the vehicle and its components by virtual design and entails report submission and viva voce.
### Semester V

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>TCH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Theory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>EE2511</td>
<td>Control Systems #</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>AT2503</td>
<td>Automotive Electrical and Electronics *</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>MS3501</td>
<td>Basics of Vehicle Dynamics</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>MS3502</td>
<td>Motorsport Vehicle Analysis</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td>MS3503</td>
<td>Ethics in Engineering and Society</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Practical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>AT2531</td>
<td>Automotive Electrical and Electronics Laboratory*</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>EE2241</td>
<td>Control Systems Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>MS3511</td>
<td>Motorsport Vehicle AnalysisLaboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9.</td>
<td>MS3512</td>
<td>Vehicle DynamicsLaboratory I</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>26</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#Common to Motorsports, Automobile –Autotronics

*Common to Automobile Engineering

### Semester VI

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>TCH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Theory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>MS3601</td>
<td>Performance Tuning of Racing Engines</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>MS3602</td>
<td>Project Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>MS3603</td>
<td>Racing Two wheelers</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>MS3604</td>
<td>Vehicle Dynamics- Testing &amp; Controls</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td>AT2603</td>
<td>Automotive Chassis Design*</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>6.</td>
<td>AT2604</td>
<td>Automotive Safety#</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Practical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>MS3611</td>
<td>Engine Tuning Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>MS3612</td>
<td>Vehicle Dynamics Laboratory II</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9.</td>
<td>MS3613</td>
<td>+Design and Fabrication of RC Cars</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>10.</td>
<td>AT2634</td>
<td>Comprehensive Viva Voce</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>29</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Common to Automobile Engineering

+ Students must design and fabricate the Remote Controlled Car in the University and test it under various conditions and entails for report submission.
**Semester VII**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>TCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>ME2757</td>
<td><strong>Computational Fluid Dynamics</strong></td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>MS4701</td>
<td>Automotive Accident Investigation and Cost Estimation</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>EE4711</td>
<td>Electronics in Motor Sports Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>MS4702</td>
<td>Aerodynamics of Racing Vehicles</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>Elective-I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>Elective-II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Practical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>MS4711</td>
<td>Computational Fluid Dynamics Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>MS4712</td>
<td>***Vehicle Maintenance &amp; Reconditioning Lab</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9.</td>
<td>MS4713</td>
<td>##Design Series I</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25</td>
</tr>
</tbody>
</table>

**Common to Mechanical Engineering**

***The Student must undergo a minimum of 15 days In-plant Training and must submit a report regarding the same.***

##This entails only a Viva-Voice and a Report on Virtual Design and Analysis of a Racing Vehicle.

**Semester VIII**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>TCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>AT2801</td>
<td>*Modern Vehicle Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>Elective-III</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>Elective-IV</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Practical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>MS2811</td>
<td>###Design Series-II</td>
<td></td>
<td></td>
<td>24</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

**Common to Automobile Engineering**

###Students must design, fabricate and test a racing vehicle (in a track).

**Total Credit : 193**
### ELECTIVES FOR VII SEMESTER

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>TCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AT 2703</td>
<td>Automotive Instrumentation and Embedded Systems*</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>MS4721</td>
<td>Business Management for Engineers</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>MS4722</td>
<td>Design for Manufacture and Assembly</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>MS4723</td>
<td>Vehicle Design Data and Characteristics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>MS4724</td>
<td>Vehicle Dynamics And Control</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>AT 4702</td>
<td>Vehicle Maintenance</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

### List of Electives for VIII Semester

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>TCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AT2853</td>
<td>Electronic Engine Management System*</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>AT2854</td>
<td>Vibration and Noise Control*</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>AT2856</td>
<td>Automotive Sensors and Applications*</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>AT2857</td>
<td>Fuel Cells and Applications*</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>AT2858</td>
<td>Robotics*</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>AT2859</td>
<td>Alternative Fuels and Energy System*</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

*Common to Automobile Engg.*
<table>
<thead>
<tr>
<th>EL 2101</th>
<th>Technical English</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>The goal of the programme is to provide a theoretical input towards nurturing accomplished learners who can function effectively in the English language skills; to cultivate in them the ability to indulge in rational thinking, independent decision-making and lifelong learning; to help them become responsible members or leaders of the society in and around their workplace or living space; to communicate successfully at the individual or group level on engineering activities with the engineering community in particular, and on multi-disciplinary activities in general, with the world at large.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>1. To widen the capacity of the learners to listen to English language at the basic level and understand its meaning.</td>
<td>1. The learners will have the self-confidence to improve upon their informative listening skills by an enhanced acquisition of the English language.</td>
<td></td>
</tr>
<tr>
<td>2. To enable learners to communicate in an intelligible English accent and pronunciation.</td>
<td>2. The learners will be able to speak English at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate.</td>
<td></td>
</tr>
<tr>
<td>3. To assist the learners in reading and grasping a passage in English.</td>
<td>3. The learners will be able to read, comprehend and answer questions based on literary, scientific and technological texts.</td>
<td></td>
</tr>
<tr>
<td>4. To learn the art of writing simple English with correct spelling, grammar and punctuation.</td>
<td>4. The learners will be able to write instructions, recommendations, checklists, process-description, letter-writing and report writing.</td>
<td></td>
</tr>
<tr>
<td>5. To cultivate the ability of the learners to think and indulge in divergent and lateral thoughts.</td>
<td>5. The learners will have the confidence to develop thinking skills and participate in brainstorming, mind-mapping, audiovisual activities, creative thinking and also answer tests in the job-selection processes.</td>
<td></td>
</tr>
</tbody>
</table>
Unit I: Listening Skill

**Topics:** Listening to the sounds, silent letters & stress in English words & sentences – Listening to conversation & telephonic conversation -- Listening for general meaning & specific information -- Listening for positive & negative comments – Listening to technical topics – Listening to prose & poetry reading -- Listening exercises.

**Embedded language learning:** Sentence definition -- Spelling & punctuation -- Imperative form -- Sequencing of sentences -- Gerunds -- Infinitives -- _Wh_-questions.

Unit II: Speaking Skill

**Topics:** Self-introduction – Expressing personal opinion – Dialogue – Conversation – Simple oral interaction -- Speaking on a topic -- Expressing views for & against -- Speaking on personal topics like hobbies, topics of interest, present & past experiences, future plans – Participating in group discussions, role plays, debates, presentations, power-point presentations & job-interviews.

**Embedded language learning:** Adverbs –Adjectives – Comparative and Numerical adjectives -- Nouns & compound nouns -- Prefixes and suffixes.

Unit III: Reading Skill

**Topics:** Reading anecdotes, short stories, poems, parts of a novel, notices, message, time tables, advertisements, leaflets, itinerary, content page -- Reading pie chart & bar chart -- Skimming and scanning -- Reading for contextual meaning – Scanning for specific information -- Reading newspaper & magazine articles -- Critical reading -- Reading-comprehension exercises.

**Embedded language learning:** Tenses – Active and passive voice -- Impersonal passive -- Words and their function -- Different grammatical forms of the same word.

Unit IV: Writing Skill

**Topics:** Writing emails, notes, messages, memos, notices, agendas, advertisements, leaflets, brochures, instructions, recommendations & checklists -- Writing paragraphs -- Comparisons & contrasts – Process description of Flow charts – Interpretation of Bar charts & Pie charts – Writing the minutes of a meeting - - Report writing -- Industrial accident reports -- Letter-writing -- Letter to the editors – Letter inviting & accepting or declining the invitation – Placing orders – Complaints -- Letter requesting permission for industrial visits or implant training, enclosing an introduction to the educational institution -- Letters of application for a job, enclosing a CV or Resume – Covering letter.

**Embedded language learning:** Correction of errors – Subject-verb Concord -- Articles -- Prepositions -- Direct and indirect speech.

Unit V: Thinking Skill

**Topics:** Eliciting & imparting the knowledge of English using thinking blocks – Developing thinking skills along with critical interpretation side by side with the acquisition of English -- Decoding diagrams & pictorial representations into English words, expressions, idioms and proverbs.

**Embedded language learning:** General vocabulary -- Using expressions of cause and effect -- Comparison & contrast -- If-conditionals -- Expressions of purpose and means.

**TOTAL:** 45
Reference Books


<table>
<thead>
<tr>
<th>MA2101</th>
<th>ENGINEERING MATHEMATICS - I</th>
<th>4 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To create the awareness and comprehensive knowledge in engineering mathematics.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to:</td>
<td>The students should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Understand to find the inverse of the matrix by using Cayley Hamilton Theorem and Diagonalisation of matrix using transformation</td>
<td>1. Identify Eigen value problems from practical areas and obtain its solutions and using transformation diagonalising the matrix which would render Eigen values.</td>
<td></td>
</tr>
<tr>
<td>2. Understand the Evolutes and Envelope of the curve.</td>
<td>2. Find out effectively the geometrical aspects of curvature and appreciates mathematical skills in constructing evolutes and envelopes in mechanics and engineering drawing.</td>
<td></td>
</tr>
<tr>
<td>3. Learn the solutions of second order linear differential equations of standard types and Legendre's linear differential equation.</td>
<td>3. Recognize and to model mathematically and solving, the differential equations arising in science and engineering.</td>
<td></td>
</tr>
<tr>
<td>4. Learn partial differentiations involving two and three variables and expansions of functions using Taylor series.</td>
<td>4. Understand and model the practical problems and solve it using maxima and minima as elegant applications of partial differentiation.</td>
<td></td>
</tr>
<tr>
<td>5. Learn the expansions of trigonometric, hyperbolic functions and their relations.</td>
<td>5. Acquire skills in using trigonometric and hyperbolic and inverse hyperbolic functions.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT I  MATRICES


UNIT II  DIFFERENTIAL CALCULUS

Review: Basic concepts of differentiation – function of function, product and quotient rules.


III  ORDINARY DIFFERENTIAL EQUATIONS

Review: Definition, formation and solutions of differential equations.

Second order differential equations with constant coefficients – Particular integrals - $e^{ax}$, $Sinax$ (or) $Cosax$, $x^m$, $e^{ax}$Cosbx, $e^{ax}$Sinbx. Euler's homogeneous linear differential equations - Legendre's linear differential equation - Variation of parameters.

UNIT IV  PARTIAL DIFFERENTIATION


UNIT V  TRIGONOMETRY

Review: Basic results in trigonometry and complex numbers - De Moivre’s theorem.

Expansions of $\sin n\theta$, $\cos n\theta$, $\text{tann}\theta$ where $n$ is a positive integer. Expansions of $\sin^m \theta$, $\cos^n \theta$, $\sin^m \theta \cos^n \theta$ in terms of sines and cosines of multiples of $\theta$ where $m$ and $n$ are positive integers. Hyperbolic and inverse hyperbolic functions – Logarithms of complex numbers – Separation of complex functions into real and imaginary parts – Simple problems.

Note: Questions need not be asked from review part.

TOTAL: 60
TEXT BOOKS:

REFERENCES:
<table>
<thead>
<tr>
<th><strong>PH2001</strong></th>
<th><strong>ENGINEERING PHYSICS</strong></th>
<th><strong>3 Credits</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To impart fundamental knowledge in various fields of Physics and its applications.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>1. To develop strong fundamentals of properties and behaviour of the materials</td>
<td>The student will</td>
<td></td>
</tr>
<tr>
<td>2. To enhance theoretical and modern technological aspects in acoustics and ultrasonics.</td>
<td>1. Be able to understand the properties and behaviour of materials.</td>
<td></td>
</tr>
<tr>
<td>3. To enable the students to correlate the theoretical principles with application oriented study of optics.</td>
<td>2. Have a fundamental knowledge of acoustics which would facilitate in acoustical design of buildings and on ultrasonics and be able to employ it as an engineering tool.</td>
<td></td>
</tr>
<tr>
<td>4. To provide a strong foundation in the understanding of solids and materials testing.</td>
<td>3. Understand the concept, working and application of lasers and fiber optics.</td>
<td></td>
</tr>
<tr>
<td>5. To enrich the knowledge of students in modern engineering materials.</td>
<td>4. Know the fundamentals of crystal physics and non-destructive testing methods.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Have an understanding of the production, characteristics and application of the new engineering materials. This would aid them in the material selection stage.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT I PROPERTIES OF MATTER


UNIT II ACOUSTICS AND ULTRASONICS


UNIT III LASER AND FIBRE OPTICS


UNIT IV CRYSTAL PHYSICS AND NON-DESTRUCTIVE TESTING


UNIT V MODERN ENGINEERING MATERIALS AND SUPERCONDUCTING MATERIALS


Superconducting Materials: Superconducting phenomena – Properties of superconductors – Meissner effect – Type I and Type II superconductors – High Tc superconductors (qualitative) – uses of superconductors.

TOTAL: 45
TEXT BOOKS


REFERENCES

5. P.Charles, Poole and Frank J. Owens, "Introduction to Nanotechnology", Wiley India, 2007
<table>
<thead>
<tr>
<th>ME 2101</th>
<th>ENGINEERING GRAPHICS</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To develop graphical skills for communicating concepts, ideas and designs of engineering products and to give exposure to national standards relating to technical drawings.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to</td>
<td>The students should be able to</td>
<td></td>
</tr>
<tr>
<td>1. Introduce drawing standards and use of drawing instruments.</td>
<td>1. Develop Parametric design and the conventions of formal engineering drawing.</td>
<td></td>
</tr>
<tr>
<td>2. Introduce first angle projection.</td>
<td>2. Produce and interpret 2D &amp; 3D drawings Communicate a design idea/concept Graphically.</td>
<td></td>
</tr>
<tr>
<td>3. Practice of engineering hand sketching and introduce to computer aided drafting</td>
<td>3. Examine a design critically and with understanding of CAD – The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D software.</td>
<td></td>
</tr>
<tr>
<td>4. Familiarize the students with different type of projections.</td>
<td>4. Get a Detailed study of an engineering Artifact.</td>
<td></td>
</tr>
<tr>
<td>5. Introduce the process of design from sketching to parametric 3D CAD and 2D orthographic drawings to BIS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
BASICS OF ENGINEERING GRAPHICS


UNIT I PROJECTION OF POINTS, LINES AND SURFACES

General principles of presentation of technical drawings as per BIS – Introduction to Orthographic projection - Naming views as per BIS – First angle projection. Projection of points. Projection of straight lines located in first quadrant using rotating line (using method only). Projection of plane surfaces like polygonal lamina and circular lamina. Drawing views when the surface of the lamina is inclined to one reference plane.

UNIT II PROJECTION OF SOLIDS

Projection of simple solids like prism, pyramid, cylinder and cone – Drawing views when the axis of the solid is inclined to one reference plane. Introduction to “section of solids’.

UNIT III DEVELOPMENT OF SURFACES

Development of lateral surfaces of truncated prisms, pyramids, cylinders and cones.

UNIT IV ORTHOGRAPHIC PROJECTIONS

Orthographic projections – Conversion to orthographic views from given pictorial views of objects, including dimensioning. Free hand sketching of Orthographic views from Pictorial views.

UNIT V PICTORIAL PROJECTIONS

Isometric projection – Isometric scale – Isometric views of simple solids like prisms, pyramids, cylinders and cones. Introduction to perspective Projections.

COMPUTERAIDED DRAFTING (Demonstration Only)

Introduction to computer aided drafting and dimensioning using appropriate software.

2D drawing commands: Zoom, Picture editing commands, Dimensioning, Isometric drawing, Iso-Planes and 3D drafting. Plotting of drawing. Practice includes drawing the projection of lines and solids. Prepare isometric view of simple solids like prisms, pyramids, cylinders and cones.

Note: Only first angle projection is to be followed

TOTAL: 60
TEXT BOOKS:


REFERENCES

3. IS 9609 - 1983 *Lettering on Technical Drawings*.
4. IS 10714 - 1983 *General Principles of Presentation of Technical Drawings*.
5. IS 11669 - 1986 *General Principles of Dimensioning of Technical Drawings*. 
<table>
<thead>
<tr>
<th>CS2101</th>
<th>COMPUTER PROGRAMMING</th>
<th>3 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To introduce computers and programming and to produce an awareness of the power of computational techniques that is currently used by engineers and scientists and to develop programming skills to a level such that problems of reasonable complexity can be tackled successfully.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the students to:</td>
<td></td>
</tr>
<tr>
<td>1. Learn the major components of a Computer system.</td>
<td></td>
</tr>
<tr>
<td>2. Learn the problem solving techniques.</td>
<td></td>
</tr>
<tr>
<td>3. Develop skills in programming using C language.</td>
<td></td>
</tr>
<tr>
<td>The student should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Understand the interaction between different components of Computer system and number system.</td>
<td></td>
</tr>
<tr>
<td>2. Devise computational strategies for developing applications.</td>
<td></td>
</tr>
<tr>
<td>3. Develop applications (Simple to Complex) using C programming language.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT I COMPUTER FUNDAMENTALS


UNIT II COMPUTER PROGRAMMING AND LANGUAGES


UNIT III PROGRAMMING WITH C


UNIT IV FUNCTIONS, ARRAYS AND STRINGS

Functions – Storage Class – Arrays – Working with strings and standard functions.

UNIT V POINTERS, STRUCTURES AND UNION


TOTAL: 45

TEXT BOOK:


REFERENCES:

CS2131                  COMPUTER PROGRAMMING LABORATORY                  2 CREDITS

Goal                   To provide an awareness to develop the programming skills using computer languages.

Objectives            Outcome
The course should enable the students to:                  The student should be able to:
(i) To gain knowledge about Microsoft office,                  (i) Use MS Word to create document, table, text formatting and
    Spread Sheet.                                              Mail merge options.
(ii) To learn a programming concept in C                   (ii) Use Excel for small calculations using formula editor,
                                       .                                creating different types of charts and including pictures etc,
(iii) Write and execute the C programs for small applications.

LIST OF EXPERIMENTS:

a) Word Processing 15
1. Document creation, Text manipulation with Scientific notations
2. Table creation, Table formatting and Conversion
3. Mail merge and Letter preparation
4. Drawing - flow Chart

b) Spread Sheet 15
5. Chart - Line, XY, Bar and Pie
6. Formula - formula editor
7. Spread sheet - inclusion of object, Picture and graphics, protecting the document

c) Programming in C :

8. To write a C program to prepare the electricity bill
9. Functions:
   (a) Call by value                     (b) Call by reference
10. To write a C program to print the Fibonacci series for the given number
11. To write a C program to find the factorial of number using recursion
12. To write a C program to implement the basic arithmetic operations using Switch Case Statement
13. To write a C program to check whether the given number is an Armstrong number
14. To write a C program to check whether the given string is a Palindrome
15. To write a C program to create students details using Structures
16. To write a C program to demonstrate the Command Line Arguments
17. To write a C program to implement the Random Access in Files
18. To write C programs to solve some of the Engineering applications
Goal
To provide the students with hands-on experience on various fitting & welding practices.

Objectives

<table>
<thead>
<tr>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Relate theory and practice of basics of Mechanical Engineering</td>
</tr>
<tr>
<td>2. Learn concepts of fitting practice</td>
</tr>
<tr>
<td>3. Learn concepts of welding practice</td>
</tr>
</tbody>
</table>

Outcome

<table>
<thead>
<tr>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identify and use of tools, Types of joints used in welding operations.</td>
</tr>
<tr>
<td>2. Have hands-on experience on basic fabrication techniques of different types of welding practices.</td>
</tr>
</tbody>
</table>

LIST OF EXPERIMENTS

1. WELDING

All types of welding such as Butt joints, Tee and lap, V joints, etc using Arc, Gas, TIG & MIG techniques.

TEXT BOOK:

<table>
<thead>
<tr>
<th></th>
<th>EL2131 COMMUNICATION SKILLS LABORATORY- I</th>
<th>2 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>The goal of the programme is to provide a practical input towards nurturing accomplished learners who can function effectively in the English language skills.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>1. To extend the ability of the learners to be able to listen to English and comprehend its message.</td>
<td>1. The learners will be able to listen to and evaluate English without difficulty and comprehend its message.</td>
<td></td>
</tr>
<tr>
<td>2. To enable the learners to have a functional knowledge of spoken English.</td>
<td>2. The learners would have developed a functional knowledge of spoken English so as to use it in the institution and at job interviews.</td>
<td></td>
</tr>
<tr>
<td>3. To assist the learners to read and grasp the meaning of technical and non-technical passages in English.</td>
<td>3. The learners will be able to read and comprehend the meaning of technical and non-technical passages in English.</td>
<td></td>
</tr>
<tr>
<td>4. To help the learners develop the art of writing without mistakes.</td>
<td>4. The learners will have developed the art of writing so as to put down their thoughts and feelings in words.</td>
<td></td>
</tr>
<tr>
<td>5. To expand the thinking capability of the learners so that they would learn how to view things from a different angle.</td>
<td>5. At the end of the course, the learners will be able to think independently and contribute creative ideas.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT I LISTENING SKILL

Topics: Listening to conversations and interviews of famous personalities in various fields -- Listening practice related to the TV -- Talk shows -- News -- Educatice programmes -- Watching films for critical comments -- Listening for specific information -- Listening for summarizing information -- Listening to monologues for taking notes -- Listening to answer multiple-choice questions.

UNIT II SPEAKING SKILL


UNIT III READING SKILL

Topics: Reading anecdotes to predict the content -- Reading for interpretation -- Suggested reading -- Short stories and poems -- Critical reading -- Reading for information transfer -- Reading newspaper and magazine articles for critical commentary -- Reading brochures, advertisements, pamphlets for improved presentation.

UNIT IV WRITING SKILL

Topics: At the beginning of the semester, the students will be informed of a mini dissertation of 1000 words they need to submit individually on any non-technical topic of their choice. The parts of the dissertation will be the assignments carried out during the semester and submitted towards the end of the semester on a date specified by the department. This can be judged as part of the internal assessment.

UNIT V THINKING SKILL

Topics: Practicing in preparing thinking blocks to decoded diagrammatical representations into English words, expressions, idioms and proverbs -- Inculcating interest in English using thinking blocks. Making pictures and improvising diagrams to form English words, phrases and proverbs -- Picture reading.

REFERENCE BOOKS


Websites for learning English

1. **British:** Learn English – British Council (Listen & Watch) - <http://learnenglish.britishcouncil.org/>
2. **American:** Randall’s ESL Cyber Listening Lab - <http://www.esl-lab.com/>
3. **Intercultural:** English Listening Lesson Library Online http://www.elllo.org/
PH 2031 - PHYSICS LABORATORY

List of Experiments

1. Torsional Pendulum - Determination of rigidity modulus of the material of a wire.
3. Viscosity - Determination of co-efficient of Viscosity of a liquid by Poiseuille's flow.
4. Lee's Disc - Determination of thermal conductivity of a bad conductor.
5. Air Wedge - Determination of thickness of a thin wire.
6. Spectrometer - Refractive index of a prism.

REFERENCE:
<table>
<thead>
<tr>
<th>MA2201</th>
<th>ENGINEERING MATHEMATICS - II</th>
<th>4 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To create the awareness and comprehensive knowledge in engineering mathematics.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to:</td>
<td>The students should be able to:</td>
<td></td>
</tr>
<tr>
<td>1) Understand the evaluation of the double and triple integrals in Cartesian and polar forms.</td>
<td>1) Find area as double integrals and volume as triple integrals in engineering applications.</td>
<td></td>
</tr>
<tr>
<td>2) Know the basics of Vector calculus.</td>
<td>2) Evaluate the gradient, divergence, curl, line, surface and volume integrals along with the verification of classical theorems involving them.</td>
<td></td>
</tr>
<tr>
<td>4) Grasp the concept of Cauchy’s integral formula, Cauchy's residue theorem and contour integration.</td>
<td>4) Evaluate the basics of complex integration and the concept of contour integration which is important for evaluation of certain integrals encountered in practice.</td>
<td></td>
</tr>
<tr>
<td>5) Know Laplace transform and inverse Laplace transform and their properties.</td>
<td>5) Have a sound knowledge of Laplace transform and its properties and their applications in solving initial and boundary value problems.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT I MULTIPLE INTEGRALS


UNIT II VECTOR CALCULUS

Review: Definition – vector, scalar – basic concepts of vector algebra - dot and cross products-properties. Gradient, Divergence and Curl – Unit normal vector, Directional derivative – angle between surfaces- Irrotational and solenoidal vector fields.Verification and evaluation of Green's theorem - Gauss divergence theorem and Stoke's theorem.Simple applications to regions such as square, rectangle, triangle, cuboids and rectangular parallelopipeds.

UNIT III ANALYTIC FUNCTIONS

Review: Basic results in complex numbers - Cartesian and polar forms - Demoivre’s theorem.


UNIT IV COMPLEX INTEGRATION

Statement and application of Cauchy's integral theorem and Integral formula – Evaluation of integrals using the above theorems – Taylor and Laurent series expansions –Singularities – Classification. Residues – Cauchy’s residue theorem (without proof) – Contour integration over unit circle and semicircular contours (excluding poles on boundaries).

UNIT V LAPLACE TRANSFORM


TOTAL: 60

Text Books :


Reference:

<table>
<thead>
<tr>
<th>CY2001</th>
<th>ENGINEERING CHEMISTRY</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To impart basic principles of chemistry for engineers.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The objective of the course is:</td>
<td>Upon successful completion of the course, the outcomes are as follows:</td>
<td></td>
</tr>
<tr>
<td>1. To make the students conversant with the basics of Water technology and Polymer science.</td>
<td>1. The students will gain basic knowledge in water analysis and suitable water treatment method.</td>
<td></td>
</tr>
<tr>
<td>2. To provide knowledge on the requirements and properties of a few important engineering materials.</td>
<td>2. The study of polymer chemistry will give an idea on the type of polymers to be used in engineering applications.</td>
<td></td>
</tr>
<tr>
<td>3. To educate the students on the fundamentals of corrosion and its control.</td>
<td>3. Exposure of the students to the common engineering materials will create awareness among the students to search for new materials.</td>
<td></td>
</tr>
<tr>
<td>4. To give a sound knowledge on the basics of a few significant terminologies and concepts in thermodynamics.</td>
<td>4. Knowledge on the effects of corrosion and protection methods will help the young minds to choose proper metal / alloys and also to create a design that has good corrosion control.</td>
<td></td>
</tr>
<tr>
<td>5. To create an awareness among the present generation about the various conventional energy sources.</td>
<td>5. Students with good exposure on the important aspects of basic thermodynamics will be able to understand the advanced level thermodynamics in engineering applications.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. A good background on the various aspects of energy sources will create awareness on the need to utilize the fuel sources effectively and also for exploring new alternate energy resources.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT I WATER TECHNOLOGY AND POLYMER CHEMISTRY


UNIT II ENGINEERING MATERIALS


UNIT III ELECTROCHEMISTRY AND CORROSION


UNIT IV CHEMICAL THERMODYNAMICS


UNIT V FUELS AND ENERGY SOURCES


Text Books:


References:

1. B. K. Sharma, Engineering chemistry, Krishna Prakasam Media (P) Ltd., 2003
4. Kuriacose & Rajaram, Vols. 1 & 2, Chemistry in Engineering and Technology, 2004
5. Puri, Sharma and Pathania, Principles of Physical Chemistry, Vishal Publishing Co. Jalandar,
<table>
<thead>
<tr>
<th>EE2211</th>
<th>BASIC ELECTRICAL &amp; ELECTRONICS</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To impart basic principles of basic electric and electronics for engineers.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the student to:</td>
<td>The students should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Understand the fundamental of electrical circuits.</td>
<td>1. Understand the basic principles of electric circuits.</td>
<td></td>
</tr>
<tr>
<td>2. Understand the principles of operation of D.C. &amp; A.C. machines, generators, motors – starter motors for automotive applications.</td>
<td>2. Know the basic principles of various network theorems.</td>
<td></td>
</tr>
<tr>
<td>3. Know about the various network theorems.</td>
<td>3. Know the construction details of electric machines.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT-1 INTRODUCTION


UNIT-2 NETWORK THEOREMS

Source transformation - Star delta conversion - Thevenin's and Norton's Theorem – Superposition Theorem – Maximum power transfer theorem

UNIT-3 AC CIRCUITS

Introduction to AC circuits – Analysis of RL, RC and RLC circuits in series and parallel – Real and reactive power – Transient response of RL and RC circuit for unit step input – Charging and discharging of Capacitors and Inductors

UNIT-4 RESONANCE

Series and parallel resonance – frequency response – Quality factor and Bandwidth -Self and mutual inductance – power and power factor measurement in three phase AC circuits

UNIT-5 DC MACHINE AND TRANSFORMER


Total 45

TEXT BOOKS:


REFERENCE BOOK:

<table>
<thead>
<tr>
<th>Goal</th>
<th>To provide an understanding of the effects of forces, torques and motion on a variety of structures and vehicles.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
</tr>
<tr>
<td>The course should enable the students to</td>
<td>The students should be able to</td>
</tr>
<tr>
<td>1. Impart knowledge on the vector and scalar representation of forces and moments</td>
<td>1. Apply the law of forces and Newton’s 2nd law in determining motion and The dynamics of particles and vehicles.</td>
</tr>
<tr>
<td>2. Impart knowledge on static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions.</td>
<td>2. Implement vectors in mechanics problems and Know about Energy and momentum conservation.</td>
</tr>
<tr>
<td>3. Understand the principle of work and energy.</td>
<td>3. Know the dynamics of a rigid body and its rotation and Do the calculation and motion of the centre of mass of a system of particles.</td>
</tr>
<tr>
<td>4. Comprehend on the effect of friction on equilibrium, the laws of motion, the kinematics of motion and the interrelationship.</td>
<td>4. Use vectors to solve mechanics problems and develop particle and vehicle trajectory equations.</td>
</tr>
<tr>
<td>5. Write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.</td>
<td>5. Calculate the motion of rigid bodies and Solving problems on engineering mechanics that arise on other modules of the course</td>
</tr>
</tbody>
</table>
UNIT I BASICS & STATICS OF PARTICLES


UNIT II EQUILIBRIUM OF RIGID BODIES


UNIT III FRICTION


UNIT IV PROPERTIES OF SURFACES AND SOLIDS


UNIT V DYNAMICS OF PARTICLES


TOTAL: 60

TEXT BOOKS:


REFERENCES:

<table>
<thead>
<tr>
<th>MS2201</th>
<th>MANUFACTURING TECHNOLOGY</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To provide an understanding on the various types of production processes involved in the manufacturing of the automobile components such as casting, welding, machining, metal forming, power metallurgy etc.</td>
<td></td>
</tr>
</tbody>
</table>

**Goal**

**Objectives**

The course should enable the student to:

1. Understand how the automobile components are manufactured.
2. Understand the various moulding processes.
3. Understand how the different machines are used for machining the components.
4. Understand how the components are joined together by methods such as, welding, brazing and soldering.
5. Understand the various manufacturing process such as forging, casting & machining.

**Outcome**

The students should be able to:

1. Describe the Principles of Oxy-acetylene gas welding, A.C metal arc welding, resistance welding, tungsten inert gas welding, metal inert gas welding, plasma arc welding, electron beam welding, laser beam welding, the difference between conventional and unconventional machining.
2. Describe the various moulding process, special casting processes and the check the defects in it.
3. Describe the general principles of working and commonly performed operations in the following machines: Lathe, Shaper, Planer, Horizontal milling machine, Universal drilling machine, cylindrical grinding machine, Capstan and Turret lathe.
4. Describe the difference between thermoplastic and thermosetting plastics and its uses in automotive applications.
5. Describe the working principles and typical applications of Injection moulding, Rotational moulding, Extrusion in thermoplastic and Compression moulding.
UNIT I: CASTING PROCESSES

Casting types, procedure to make sand mould, types of core making, moulding tolls, machine moulding, special moulding processes- CO₂ moulding; shell moulding, investing moulding, permanent mould casting, pressure die casting, centrifugal casting, continuous casting, casting defects.

UNIT II: WELDING


UNIT III: MACHINING

Introduction of Lathe and its types. Description and function of its parts. Various machining operations – Phasing, Turning, Thread Cutting, Taper Turning, Eccentric Turning, Chamfering, Knurling, Polishing, Grooving, Spinning, Spring Winding, Forming, Drilling, Reaming, Boring etc.

UNIT IV: FORMING AND SHAPING OF PLASTICS


UNIT V: METAL FORMING & POWDER METALLURGY


STUDY PURPOSE ONLY

Introduction & working principles of Shaper, Planner, Boring, Drilling, Slotting, Grinding, Milling, Gear Cutting Machines.

TOTAL: 45

Text Books:


References:

List of Experiments

1. Estimation of Commercial soda by acid-base titration
2. Determination of Percentage of nickel in an alloy
3. Determination of Temporary, permanent and total hardness of water by EDTA method
4. Determination of Chloride content in a water sample
5. Potentiometric Estimation of iron
6. Conductometric Titration of a strong acid with a strong base
7. Conductometric Titration of mixture of acids.
8. Determination of Degree of polymerization of a polymer by Viscometry

References:


Total: 45
List of Experiments

Perform Various Operations such as

Facing, Turning, Thread Cutting, Taper Turning, Eccentric Turning, Chamfering & Knurling, Polishing, Grooving, Spinning, Forming, Drilling, Reaming, Boring by using lathe machine.

LIST OF EQUIPMENTS
(For batch of 30 students)

1. Lathe (10)

Total: 45
EE2241 BASIC ELECTRICAL AND ELECTRONICS LABORATORY

LIST OF EXPERIMENTS

1. Verification of Thevenin’s and Norton’s theorem.
2. Verification of Superposition and Maximum power transfer theorem.
3. Verification of Kirchoff’s laws.
4. Frequency response of RL and RC circuits
5. Analysis Series and parallel resonant circuits
6. Transients in RC circuits
7. Design of High and Low pass filter
8. Load test on DC shunt and series motor
9. Open circuit and short circuit test on single phase Transformer
10. Measurements using Current and Potential Transformer

LIST OF EQUIPMENTS

(For batch of 30 students)

1. DC Shunt motor - 2 No
2. DC Series motor - 1 No
3. DC shunt motor-DC Shunt Generator set - 1 No
4. DC Shunt motor-DC Series Generator set - 1 No
5. Single phase transformer - 2 No
6. Three phase alternator - 2 No
7. Three phase synchronous motor - 1 No
8. Three phase Squirrel cage Induction motor - 1 No
9. Three phase Slip ring Induction motor - 1 No
10. Single phase Induction motor - 1 No

Total: 45
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL2231</td>
<td>COMMUNICATION SKILLS LABORATORY II</td>
<td>3</td>
</tr>
</tbody>
</table>

**Goal**
The goal of the programme is to provide an advanced practical input towards moulding student-achievers who can use the English language with ease.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
</table>
| 1. To extend the power of the learners to listen to English at an advanced level and comment on it.  
2. To guide the learners to speak English at the formal and informal levels.  
3. To enable learners to read and grasp the in-depth meaning of technical and non-technical passages in English.  
4. To help the learners develop the art of writing at the formal and informal levels.  
5. To expand the thinking capability of the learners so that they would learn how to be original in their thoughts. | 1. The learners will be able to listen to and understand English at an advanced level and interpret its meaning.  
2. The learners would have developed English at the formal and informal levels and thus gained the confidence to use it without fear.  
3. The learners will be able to read and grasp the in-depth meaning of technical and non-technical passages in English.  
4. The learners will have developed the art of formal and informal writing.  
5. The learners will be able to think independently and creatively and also verbalize their thoughts fearlessly. |
Unit I: Listening Skill

Topics: Listening to telephonic conversations -- Listening to native British speakers -- Listening to native American speakers -- Listening to intercultural communication -- Listening to answer questions as one-liners and paragraphs -- Listening to group discussions -- Listening to films of short duration.

Unit II: Speaking Skill

Topics: Interview skills – People skills – Job interview – Body language and communication -- How to develop fluency -- Public speaking -- Speaking exercises involving the use of stress and intonation – Speaking on academic topics – Brain storming & discussion – Speaking about case studies on problems and solutions – Extempore speeches – Debating for and against an issue – Mini presentations – Generating talks and discussions based on audiovisual aids.

Unit III: Reading Skill

Topics: Reading exercises for grammatical accuracy and correction of errors -- Reading comprehension exercises with critical and analytical questions based on context – Evaluation of contexts – Reading of memos, letters, notices and minutes for reading editing and proof reading -- Extensive reading of parts of relevant novels after giving the gist of the same.

Unit IV: Writing Skill

Topics: At the beginning of the semester, the students will be informed of a mini dissertation of 2000 words they need to submit individually on any non-technical topic of their choice. The parts of the dissertation will be the assignments carried out during the semester and submitted towards the end of the semester on a date specified by the department. This can be judged as part of the internal assessment.

Unit V: Thinking Skill

Topics: Practice in preparing thinking blocks to decode pictorial representations into English words, expressions, idioms and proverbs -- Eliciting the knowledge of English using thinking blocks -- Picture rereading -- Finding meaning in the meaningless – Interpreting landscapes, simple modern art and verbal and non-verbal communication.

Total: 45

Reference Books


Websites for learning English

1. British: Learn English – British Council (Business English) - <http://learnenglish.britishcouncil.org/>

2. BBC Learning English (General and Business English) - <http://www.bbc.co.uk/worldservice/learningenglish/>

3. Intercultural: English Listening Lesson Library Online <http://www.elllo.org/>
### Goal
The module provides an introduction to the history of motorsports engineering. Structure & organisation of motorsport and motorsport industry, including the business of F1 and careers in motorsport.

<table>
<thead>
<tr>
<th>Objective</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the students to</td>
<td>The students shall be able to</td>
</tr>
<tr>
<td>1. Gain knowledge in introduction to</td>
<td>1. Understand the advantages of motorsports industry.</td>
</tr>
<tr>
<td>motorsport engineering.</td>
<td></td>
</tr>
<tr>
<td>2. List out the events and competitions</td>
<td>2. Brief about the events and competitions</td>
</tr>
<tr>
<td>3. Develop interest about the national</td>
<td>3. Take part in national and international events</td>
</tr>
<tr>
<td>and international events.</td>
<td></td>
</tr>
<tr>
<td>4. Gain knowledge about the rules and</td>
<td>4. Apply knowledge to design and built the vehicle as per the rules and regulations.</td>
</tr>
<tr>
<td>regulations for motorsports.</td>
<td></td>
</tr>
<tr>
<td>5. Plan the career in motorsports</td>
<td>5. Execute and make themselves as a flagship engineer in motorsport industry.</td>
</tr>
</tbody>
</table>
UNIT 1 – INTRODUCTION TO MOTORSPORT ENGINEERING 8

The history of motorsport engineering-Review of motorsport engineering-Pioneers of Motorsport engineering -Motorsport technology evolution review- Secrecy in Motorsport engineering

UNIT 2 – LIST OF MOTORSPORT COMPETITIONS FOR STUDENTS 8

A brief look at all the events students can take part to develop their skills - Formula SAE - Baja SAE - SAE Super mileage.

UNIT 3 – PROFESSIONAL MOTORSPORT EVENTS 12

The various types of professional motorsport events that take place around the world - Cars – Formula One, World rally championship, Touring car championship, GP2, GP3, World Endurance Racing Championship, dirt track racing, NASCAR, Indy Car, Cross Country rallies, drag racing - Motorcycles – MotoGP, Superbike, Endurance, Motocross, Supermoto, Freestyle, Trials, Cross-country rallies, Speedway, Board track, drag racing

UNIT 4 – RULES AND REGULATIONS OF MOTORSPORTS 10

All about the most important book for a motorsport engineer – the rule book - About - the world governing bodies of the sport - Why the rule book keeps changing - How to interpret the rule book- Rules for car races - Rules for bikes races

UNIT 5 – CAREER IN MOTORSPORTS 7

A sneak peek into all the awesome jobs- Motorsport Engineer Race Driver / Rider - Test Driver / Rider - Design engineer - Race technician -Aerodynamics Engineer - Race official / steward

TOTAL 45

TEXT BOOKS


REFERENCE BOOKS


<table>
<thead>
<tr>
<th>MS2302</th>
<th>ENGINE TECHNOLOGY</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To impart knowledge in development of engine technologies</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course enables the students to</td>
<td>The students should be able to</td>
<td></td>
</tr>
<tr>
<td>1. Penetrate deep into engine classification, construction and operation of IC engines with latest technologies</td>
<td>1. Grasp the basic engine terminologies</td>
<td></td>
</tr>
<tr>
<td>2. Grasp the importance SI and CI engine application in automobiles</td>
<td>2. Describe SI and CI engine system application in automobiles.</td>
<td></td>
</tr>
<tr>
<td>3. Understand the performance parameters and testing methodologies.</td>
<td>3. Differentiate the fuel dynamics for SI and CI engines and define the key terms such as carburetion, injection, stoichiometric ratio, lean burn etc.,</td>
<td></td>
</tr>
<tr>
<td>4. Understand the necessity of Ignition system SI engines</td>
<td>4. To design combustion chambers for SI /CI engines with reference to variable compression ratios</td>
<td></td>
</tr>
<tr>
<td>5. Understand the combustion process for both SI and CI engines, the concepts of Governors, Fuel pump, Fuel Injectors.</td>
<td>5. Analyze the combustion phenomenon within the combustion chamber and Determine the combustion behavior in SI and CI mode. The performance characteristics in both SI and CI engines theoretically / practically.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT I: CONSTRUCTION AND OPERATION OF IC ENGINES

Constructional and working details of spark ignition (SI) and compression ignition (CI) engines. Two stroke and four stroke SI and CI engines. Comparison of SI and CI engines. Classification of engine, Different Cycles (Otto, diesel and dual cycles).

UNIT II: SI Engines


UNIT III: CI Engines

Diesel fuel injection system, Function of Components, Jerk type pump, Distributor pump, CRDI Mechanical and pneumatic Governor, Fuel Injector, Types of nozzle, importance of Swirl, Squish, Turbulence air motion, Combustion in CI Engines – Combustion Chambers, Stages of Combustion, Factors affecting Ignition Delay, Knock in CI engines.

UNIT IV: Auxiliary Systems

Types of supercharging and turbo charging, relative merits, matching of turbocharger, cooling system - types of cooling systems- air and liquid cooling systems. Thermo syphon and forced circulation and pressurized cooling systems – Lubrication System - Requirements of lubrication systems. Types-mist, pressure feed, dry and wet sump systems. Properties of lubricants. Design of air intake system / exhaust system, design of valve system.

UNIT V: Performance Testing and Modern Engine Technology


Text books:
1. Mathur and Sharma Internal Combustion Engines DhanpatRai and Sons 2002
2. John B. Heywood, —Fundamentals of Internal Combustion Engines

References
1. Advanced Engine Technology by Heisler, SAE Publication
2. Edward F. Obert Internal Combustion Engines
3. H.N. Gupta Fundamentals of Internal Combustion Engines by, PHI
<table>
<thead>
<tr>
<th>AT2302</th>
<th>APPLIED THERMODYNAMICS</th>
<th>4 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td><strong>To expose the student to understand the concept of first law and second law of thermodynamics and their applications, the various power cycles and their applications, Air compressors and their performance evaluation fundamentals of heat transfer</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the student to :</td>
<td>The students should be able to :</td>
<td></td>
</tr>
</tbody>
</table>

1. Understand the principles of thermodynamics and the applications of first and second law of thermodynamics.  
2. Grasp the concepts of heat engine and heat pump.  
3. Understand the concept of gas power cycle,  
4. Understand the vapour power cycle and refrigeration cycles.  
5. Understand the concept of heat transfer with their applications.

1. Describe the principles of first and second law of thermodynamics.  
2. Identify and describe the gas power cycles, vapour power cycles and refrigerator cycles.  
3. Identify and describe the vapour power cycles and refrigerator cycles.  
4. Describe the performance of reciprocating air compressors.  
5. Apply the concepts of heat transfer to the real time applications.
UNIT - I: FIRST LAW OF THERMODYNAMICS
System, thermodynamic equilibrium, state, property, process, cycle, Zeroth law of thermodynamics, energy, work, heat, first law of thermodynamics, PMM I, ideal gases, application of first law of thermodynamics to closed and open systems, pressure – volume diagrams, steady flow process, application of steady flow energy equation.

UNIT - II: SECOND LAW OF THERMODYNAMICS
Limitations of first law, statements of second law of thermodynamics, PMM II, Clausius inequality, heat engine, heat pump, refrigerator, carnot cycle, carnot theorem, entropy, temperature – Entropy diagram, entropy changes for a closed system.

UNIT - III: GAS POWER CYCLES, FLUID FLOW AND VAPOUR POWER CYCLE
Air standard Brayton cycle with inter-cooling, reheating and regeneration properties of steam, one dimensional steady flow of gases and steam through nozzles and diffusers, Rankine cycle.

UNIT - IV: RECIPROCATING AIR COMPRESSORS, REFRIGERATION CYCLES
Single acting and double acting air compressors, work required effect of clearance volume, volumetric efficiency, isothermal efficiency, free air delivery, multistage compression, condition for minimum work. Fundamentals of refrigeration, C.O.P., reversed Carnot cycle, simple vapour compression refrigeration system, T-S, P-H diagrams, simple vapour absorption refrigeration system, desirable properties of an ideal refrigerant.

UNIT - V: FUNDAMENTALS OF HEAT TRANSFER
Modes of heat transfer, Fourier's law of conduction, one dimensional steady state conduction through plane and composite walls, cylinders and spheres. Free and forced convection, dimensionless numbers, thermal boundary layer, heat transfer co-efficient, simple problems in fins, heat transfer between fluids separated by plane and cylindrical walls, overall heat transfer coefficient, heat exchangers, LMTD, concept of radiation- Planck's law, Wien's displacement law, Stefan Boltzmann law, Black body and Grey body radiation.

TOTAL: 60

TEXT BOOKS

REFERENCES
<table>
<thead>
<tr>
<th>ME2302</th>
<th>FLUID MECHANICS</th>
<th>4 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>Provide an understanding of fundamental aspects of the physics of fluid flow, and to develop tools to analyse simple engineering fluids systems.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the student to:</td>
<td>The students should be able to:</td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to</td>
<td>1. Understand important fluid properties and principles in fluid mechanics.</td>
<td></td>
</tr>
<tr>
<td>1. Impart knowledge on the properties of fluid flow and methods of analysis, including conservation's principles for mass, momentum and energy.</td>
<td>2. Perform straightforward analysis of examples on conservation of mass and momentum.</td>
<td></td>
</tr>
<tr>
<td>2. Generate a framework for advanced courses by introducing and classifying common engineering applications.</td>
<td>3. Use dimensional analysis in appropriate ways and explain the physical meaning of various non-dimensional parameters.</td>
<td></td>
</tr>
<tr>
<td>3. Impart knowledge on the concepts of laminar and turbulent flow, boundary layers, bluff body and streamlined flow, transition, separation and cavitation.</td>
<td>4. Assess simple flows and their behaviour from fundamental information such as the value of the Reynolds number and the shape of the body.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT I FLUID STATICS

Fluid - Definition, distinction between solid and fluid - Units and dimensions - Properties of Fluid - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension - pressure head - Pascal's law - absolute and gauge pressures - measurement of pressure - manometers (single, U-tube, differential), Mechanical gauges - Hydrostatic forces on a submerged plane and curved surfaces - centre of pressure - Buoyancy and Floatation - Meta-centric height - stability of floating and submerged bodies.

UNIT II FLUID KINEMATICS

Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms) - Equation of streamline - stream function - velocity potential function - circulation - flownet.

Fluid Dynamics:


UNIT III INCOMPRESSIBLE FLUID FLOW

Reynold's experiment - critical Reynolds number - Navier - stokes equations of motion (statement only) - relation between shear stress and pressure gradient - flow of viscous fluid in circular pipes - Haigenpoiseuille's equation - turbulent flow - Darcy Weisbach equation - major and minor energy losses - pipes in series and parallel - power transmission through pipes.

UNIT IV DIMENSIONAL ANALYSIS

Fundamental and derived units - Dimensional consistency - Dimensionless groups in fluid mechanics: Reynolds number etc. - Buckingham pi theorem with applications to fluid flow and fluid machines - similarity laws and models.

UNIT V BOUNDARY LAYER

Bluff and streamlined bodies - Concept of a boundary layer - Boundary layer separation - Pressure distribution around cylinders and aerofoils - Lift and drag - Cavitation.

TOTAL: 60

TEXT BOOKS

REFERENCES


<table>
<thead>
<tr>
<th><strong>MS2303</strong></th>
<th><strong>FUELS AND LUBRICANTS</strong></th>
<th><strong>3 Credits</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To understand the properties of fuels and lubricants for the design and operation of the I.C engines.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Objectives</strong></th>
<th><strong>Outcome</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the student to:</td>
<td>The students should be able to:</td>
</tr>
<tr>
<td>1. Due to different chemical composition, different fuels behave differently during combustion process. Also their end products are different for different combination of parameters, like pressure, temperature, air etc.</td>
<td></td>
</tr>
<tr>
<td>2. To justify the selection of proper fuel and lubricants for particular vehicle and particular assembly students of automobile engineering must have knowledge of fuels and lubricants.</td>
<td></td>
</tr>
<tr>
<td>3. This course enables students of automobile engineering to understand the fuels and lubricants with reference to vehicle performance.</td>
<td>1. The course content should be taught and with the aim to develop different types of skills so that students are able to acquire following competency:</td>
</tr>
<tr>
<td>2. Select proper fuel and lubricant depending upon application for better performance and maintenance of automobiles</td>
<td></td>
</tr>
</tbody>
</table>

58
UNIT 1. MANUFACTURE OF FUELS AND LUBRICANTS

Fuels, Structure of petroleum, refining process, fuels, thermal cracking, catalytic cracking, polymerization, alkylation, isomerisation, blending, products of refining process. Manufacture of lubricating oil base stocks, manufacture of finished automotive lubricants.

UNIT 2. THEORY OF LUBRICATION

Engine friction: introduction, total engine friction, effect of engine variables on friction, Hydrostatic lubrication, hydrodynamic lubrication, elasto hydrodynamic lubrication, boundary lubrication, bearing lubrication, functions of the lubrication system, introduction to design of a lubricating system.

UNIT 3. LUBRICANTS

Specific requirements for automotive lubricants, oxidation deterioration and degradation of lubricants, additives and additive mechanism, synthetic lubricants, classification of lubricating oils, properties of lubricating oils, tests on lubricants. Grease, classification, properties, test used in grease.

UNIT 4. PROPERTIES AND TESTING OF FUELS

Specifications of fuels, Additive - mechanism, requirements of an additive, petrol fuel additives and diesel fuel additives, Thermo-chemistry of fuels, properties and testing of fuels, relative density, calorific value, distillation, vapour pressure, flash point, spontaneous ignition temperature, viscosity, pour point, flammability, ignitability, diesel index, API gravity, aniline point etc.

UNIT 5. COMBUSTION & FUEL RATING

Stoichiometry - calculation of theoretically correct air required for combustion of liquid and gaseous fuels, volumetric and gravimetric analysis of the dry products of combustion, heat loss due to incomplete combustion, exhaust gas analysis by Orsat apparatus. Heating value of fuels, higher and lower heating values, Volatility characteristics of SI & CI Engine fuels, knock rating and additives, Octane & Cetane rating, HUCR, and CCR.

TOTAL: 45

TEXT BOOKS


REFERENCES

<table>
<thead>
<tr>
<th>MS2311</th>
<th>ENGINE TESTING LABORATORY</th>
<th>1 Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>The students will be able to understand the list of the experiments and the various types of equipment.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the student to</td>
<td>The students should be able to know</td>
<td></td>
</tr>
<tr>
<td>1. Understand the Working principle of hydraulic, electrical and eddy current dynamometers</td>
<td>1. Carryout the Experiment to determine the Performance of Various IC engines</td>
<td></td>
</tr>
<tr>
<td>2. Understand the Valve timing and port timing diagram</td>
<td>2. Define the Engine Parameters and their effects over the Performance</td>
<td></td>
</tr>
<tr>
<td>3. understand the Importance of Performance Testing of IC Engines</td>
<td>3. Determine the P-θ and P-V Values</td>
<td></td>
</tr>
</tbody>
</table>
LIST OF EXPERIMENTS

1. Study of hydraulic, electrical and eddy current dynamometers
2. Valve timing and port timing diagrams
3. Performance test on
   a. Single Cylinder SI & CI Engines.
   b. Multi Cylinder SI & CI Engines.
   c. VCR Engine.
   d. Engines with Blended Fuels.
4. Retardation test on Engines.
5. Heat balance test on
   b. Multi-cylinder CI engine
6. Morse test on
   a. Multi-cylinder SI engine
   b. Multi-cylinder CI engine
7. Study of P-θ and P-V diagrams for IC engine with piezo-electric pick up, charge amplifier, angle encoder.

THE LIST OF EQUIPMENTS ------ Each 1 No

(FOR A BATCH OF 30 STUDENTS)

1. Hydraulic dynamometer
2. Eddy current dynamometer
3. Electrical dynamometer
4. Single cylinder two stroke cut section engine
5. Single cylinder four stroke cut section engine
6. VCR Engine
7. Multi-cylinder SI & CI engine test rig with heat balance arrangement

Total: 45
<table>
<thead>
<tr>
<th>MS2312</th>
<th>FLUID MECHANICS LABORATORY</th>
<th>1 Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To find the coefficient of discharge of orifice meter and venturimeter.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the student to:</td>
<td>The students should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Understands the properties of the fluid and also to learn about the pressure and velocity of the flowing fluid using venturimeter, orifice meter.</td>
<td>1. Determine the coefficient of discharge of orifice meter and venturimeter.</td>
<td></td>
</tr>
<tr>
<td>2. Understand the change in pressure (friction factor) of given set of pipes.</td>
<td>2. Determine the friction factor of given set of pipes when there is change in pressure. Calculate the rate of flow using Rotameter.</td>
<td></td>
</tr>
</tbody>
</table>
LIST OF EXPERIMENTS

1. Determination of co-efficient of discharge for orifice
2. Determination of co-efficient of discharge for notches
3. Determination of co-efficient of discharge for venturimeter
4. Determination of co-efficient of discharge for orifice meter
5. Calculation of the rate of flow using Rotameter.
6. Study of impact of jet on flat plate (normal / inclined)
7. Determination of friction losses in pipes
8. Determination of minor losses in pipes
9. Critical Reynolds Number In Pipe Flow

LIST OF EQUIPMENT

(For the batch of 30 students)
1. Orifice meter setup
2. Venturi meter setup
3. Rota meter setup
4. Pipe Flow analysis setup
5. Osborne Reynolds apparatus

Total: 45
<table>
<thead>
<tr>
<th>MS2313</th>
<th>FUELS AND LUBRICANTS LABORATORY</th>
<th>1 Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To provide the students with the ability to investigate the fuels and lubricants property to enhance his / her independent practical abilities.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to:</td>
<td>The students should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Do independent experiments to find out the properties of fuels and lubricants.</td>
<td>1. Produce high focused independent practical skill on fuels and lubricants.</td>
<td></td>
</tr>
<tr>
<td>2. Grasp the importance of fuels and lubricants.</td>
<td>2. Identify how they can be involved in doing experiments.</td>
<td></td>
</tr>
<tr>
<td>3. Do the experiments with different constrains.</td>
<td>3. Perform an in-depth analysis related with any fuel / lubricant.</td>
<td></td>
</tr>
<tr>
<td>4. Be familiar with the properties of fuels and lubricants.</td>
<td>4. Describe how the temperature and friction can influence the properties of fuels and lubricants.</td>
<td></td>
</tr>
</tbody>
</table>
LIST OF EXPERIMENTS

1. Temperature dependence of viscosity of lubrication oil by Redwood viscometer.
2. Viscosity index of lubricating oil by Say bolt viscometer
3. Flash and fire points of fuels.
4. Flash and fire points of lubricants.
5. ASTM distillation test of gasoline
6. Drop point of grease
7. Mechanical penetration in grease.
8. Aniline distillation test of gasoline
9. Reid vapor pressure test.
10. Study and determination of Calorific Value & properties of Fuels.
11. Gas chromatograph (For study purpose)
12. Gas Spectrometer (For study purpose)

LIST OF EQUIPMENTS ----- Each 1 No (for a batch of 30 students)

1. Redwood Viscometer
2. Say bolt Viscometer
3. Flash and Fire point apparatus
4. ASTM distillation test apparatus
5. Mechanical penetration apparatus for grease
6. Aniline distillation test apparatus
7. Reid vapor pressure test apparatus
8. Drop point of grease apparatus
9. Bomb Calorimeter

Total: 45
MS2314  |  SPECIAL MACHINES LAB  |  1 Credit
---|---|---
**Goal**  | To provide the students with the ability to perform various machining operation in special machines.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
</table>
The course should enable the students to:  | The students should be able to: |
1. Know utilization of various special machines.  | 1. Make a final product using special machines.

**LIST OF EXPERIMENTS**

1. Machining Rectangular Block Using Shaper
2. Machining Rectangular Block Using Milling Machine
3. Machining V Block Using Shaper
4. Spur & Helical Gear Cutting
5. Slot Cutting
7. Laser cutting using CNC

**LIST OF EQUIPMENTS** ---- Each 1 No *(for a batch of 30 students)*

1. Shaper
2. Milling Machine
3. Slotter
4. Cylindrical Grinding Machine
5. Hobbing Machine
6. Turret & Capstan Lathe
7. Laser cutting CNC

**Total:** 45
Semester IV

<table>
<thead>
<tr>
<th>MS2401</th>
<th>THEORY OF MACHINES</th>
<th>4 Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To expose the students the different mechanisms, their method of working, Forces involved and consequent vibration during working.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td>The course should enable the student to:</td>
<td><strong>Outcome</strong></td>
</tr>
<tr>
<td></td>
<td>1. This is a module on the application of fundamental mechanics to realistic machine configurations.</td>
<td>The students should be able to:</td>
</tr>
<tr>
<td></td>
<td>2. The analysis provides the link between component motion and the resulting internal stresses due to inertia.</td>
<td>1. Outline a practical methodology in the application of mechanics and vector analysis to real machine configurations.</td>
</tr>
<tr>
<td></td>
<td>3. The subject also introduces computing as a tool for the solution of more complex robotics/linkage problems.</td>
<td>2. Analyse and redesign common elements in machine design;</td>
</tr>
<tr>
<td></td>
<td>4. This subject also provides a good basis for study in multibody mechanics and robotics and some aspects of biomedical engineering.</td>
<td>3. Apply and develop computer programmes to implement matrix analysis which</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Models the forces being generated in a linkage system</td>
</tr>
</tbody>
</table>
UNIT - I: MECHANISMS


UNIT - II: FRICTION

Friction in screw and nut – Pivot and collar – Thrust bearing – Plate and disc clutches – Belt (flat and V) and rope drives. Ratio of tensions – Effect of centrifugal and initial tension – Condition for maximum power transmission – Open and crossed belt drive.

UNIT - III: GEARING AND CAMS

Gear profile and geometry – Nomenclature of spur and helical gears – Gear trains: Simple, compound gear trains and epicyclic gear trains - Determination of speed and torque- Cams – Types of cams – Design of profiles – Knife edged, flat faced and roller ended followers with and without offsets for various types of follower motions.

UNIT - IV: BALANCING

Static and dynamic balancing – Single and several masses in different planes –Balancing of reciprocating masses- primary balancing and concepts of secondary balancing – Single and multi-cylinder engines (Inline) – Balancing of radial V engine – direct and reverse crank method.

UNIT V MECHANISMS FOR CONTROL


Gyroscopes: Gyroscopic forces and Torques-Gyroscopic stabilization-Gyroscopic effects in Automobiles

TOTAL: 60

TEXT BOOKS


REFERENCES

<table>
<thead>
<tr>
<th>MS2402</th>
<th>VEHICLE HANDLING SYSTEMS</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>The aim of this module is to provide a comprehensive introduction towards the vehicle handling systems</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Objectives</strong></th>
<th><strong>Outcome</strong></th>
</tr>
</thead>
</table>
| The course should enable the student to  
  1. The introduction to the vehicle handling components.  
  2. The working of the various vehicle components.  
  3. The impact of the vehicle handling components.  
  4. The effects of the systems individually and the as a whole. | Upon completion, the student should be able to  
  1. The understanding of the of the vehicle handling.  
  2. The vehicle components understanding.  
  3. The basics of the handling components. |
UNIT I INTRODUCTION

Types of chassis layout with reference to power plant locations and drives, vehicle frames, various types of frames, monocoque structure separate/composite (chassis/body), constructional details, materials, testing of vehicle frames, unitized frame body construction. SUPPORT MOUNTINGS: Engine, exhaust, transmission, suspension, steering, wheels/axles, electrical units, auxiliary bodies/attachments (eg.fuel tanks), seat belts/restraints.

UNIT II STEERING SYSTEM

Steering wheel geometry: castor, camber, king pin inclination, toe-in. conditions for true rolling motion of wheels during steering, steering geometry, Ackermann steering system, constructional details of steering linkages, different types of steering gear boxes, steering linkages and layouts, turning radius, wheel wobble, power assisted and Electronic Steering System. Rack and pinion, steering boxes/idlers, steering joints, swivel pin assemblies, drop arm, drag link, track rods/steering arms, front hubs, bearings/seals, hub nut locking devices, lubrication, sealing devices

UNIT III SUSPENSION

Need of suspension system, types of suspension, suspension springs, constructional details and characteristics of rubber suspension, pneumatic suspension, shock absorbers. Suspension systems: Independent, non-independent, beam axle, live axle, strut(Macpherson strut), wish bone, trailing arm/semi trailing arm, swinging arm, torsion beam, De-Dion Suspension arms/links, springs(leaf, coil, torsion, rubber, gas with mechanical/hydraulic operation), suspension dampers, telescopic/lever arm types, swivel pins/Macpherson struts, swivel pins/ball joints, bushes, location rods/linkages, anti-roll bars, sub-frame assemblies, leaf spring shackles/locating devices, axles, hubs/struts acting as suspension members, chassis mounting points, bound/rebound stops.-supporting the sprung weight, minimizing unsprung weight, absorbing torque reaction- Introduction to semi-active and active suspension system.

UNIT IV BRAKING SYSTEM

Classification of brakes, drum brakes and disc brakes, constructional details, theory of braking. Concept of dual brake system, parking brake, material, hydraulic system, vacuum assisted system, air brake system, anti-lock braking, retarded engine brakes, eddy retarders and electronic braking system. Components: Master Cylinder, wheel cylinders, pipes/flexible hoses, brake pedal, limiting valves, stop lamp switches, indicating circuits.

UNIT V TYRES AND WHEELS

Wheels &Tyres : Tubed tyres, tubeless tyres, cross-ply tyres, radial ply tyres, bias belt tyres, remould/retread/recut tyres, steel/spoke/cast alloy wheels, well base wheels, divided rim wheels, detachable flange wheels, ‘run flat’ assemblies, spacesaver assemblies. Transmit drive to the road surface, withstand forces during braking/cornering, support the weight of the vehicle, absorb shock loads, provide minimum rolling resistance, minimize unsprung weight, maintain grip in wet conditions. High performance/asymmetric/low profile, tread patterns for various climatic conditions/operational requirements, relationship between tread rating/ load carrying capacity, types, sizes, speed ratings, tyre symbols, aspect ratio, wheel balancing, use of tread-depth indicators

Total: 45
<table>
<thead>
<tr>
<th>MS2403</th>
<th>DRIVE LINE SYSTEMS</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>The aim of this module is to provide a comprehensive introduction towards the vehicle driveline system.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the student to</td>
<td>Upon completion, the student should be able to</td>
<td></td>
</tr>
<tr>
<td>1. Introduction to the driveline system</td>
<td>1. Knowing the drive line systems</td>
<td></td>
</tr>
<tr>
<td>2. The use of the various joints and the propeller shaft.</td>
<td>2. Understanding the application of the components.</td>
<td></td>
</tr>
<tr>
<td>3. Knowledge of the final drives of the vehicle construction.</td>
<td>3. Exposure to the types of driveline used in the various types of motorsports</td>
<td></td>
</tr>
<tr>
<td>4. Different types of the differential used in the motorsports and their applications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Understanding the various types of vehicles and the driveline components used</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
MS2403 DRIVE LINE SYSTEMS

UNIT I VEHICLE DRIVES

Vehicle Drives, Drive Shafts & Hubs: Transmit drive from gearbox to final drive unit, accommodate angular deflection of drive, allow for change of distance between components, and locate road wheels. Front wheel drive: Hub arrangements drive flange locations.

UNIT II JOINTS AND PROPELLER SHAFT

Constant Velocity Joints: Type of friction in the joint, tubular propeller shafts, center bearing on propeller shafts, type of friction I the bearing, associated problem of speed variation with angular displacement. Universal Joints : Hooke, Layrub, Doughnut Sliding joint on a propeller shaft, correct alignment of universal joints in series on a propeller shaft by a sliding joint, type of friction encountered in such a joint, forces acting on shafts

UNIT III FINAL DRIVE

Rear mounted live axle(including type of axle), rear mounted trans-axle, front wheel drive, chassis mountings. Differential unit, torque reaction on a live rear axle, driving/stretching conditions, pinion location in relation to crown wheel, _axial thrust_ for spiral bevel, worm/wheel gear ratios.

UNIT IV DIFFERENTIAL


UNIT V CASE STUDIES

Final drive arrangements in racing two wheelers, formula vehicles, all terrain vehicles,

Total: 45
**ME2402** | **STRENGTH OF MATERIALS** | **4 Credits**
---|---|---
**Goal** | Understand the basic concepts and techniques, both theoretical and experimental, with emphasis on the application of these to the solution of suitable problems in engineering. Provide a firm foundation for more advanced study. |  
**Objectives** | The course should enable the students to | **Outcome** | The students should be able to  
1. Gain knowledge of simple stresses, strains and deformations components due to external loads. |  
2. Assess stresses and deformations through mathematical models of beams, twisting bars or combination of both. |  
3. Provide the Basic knowledge for use in the design courses. |  
2. Assess the strength and stiffness of simple structural components. |  
3. Apply the effect of stress and deformation concepts in practical applications. |
UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS

Rigid and Deformable bodies - Strength, Stiffness and Stability - Stresses; Tensile, Compressive and Shear - Deformation of simple and compound bars under axial load - Thermal stress - Elastic constants - Strain energy and unit strain energy - Strain energy in uniaxial load.

UNIT II BEAMS - LOADS AND STRESSES

Types of beams: Supports and Loads - Shear force and Bending Moment in beams - Cantilever, Simply supported and Overhanging beams - Stresses in beams - Theory of simple bending - Stress variation along the length and in the beam section - Effect of shape of beam section on stress induced - Shear stresses in beams.

UNIT III TORSION

Analysis of torsion of circular bars - Shear stress distribution - Bars of Solid and hollow circular section - Stepped shaft - Twist and torsion stiffness - Compound shafts - Fixed and simply supported shafts - Application to close-coiled helical springs - Maximum shear stress in spring section including Wahl Factor - Deflection of Close-coil helical springs under axial loads - Design of helical coil springs.

- stresses in helical coil springs under torsion loads

UNIT IV BEAM DEFLECTION


UNIT V ANALYSIS OF STRESSES IN TWO DIMENSIONS

Biaxial state of stresses - Thin cylindrical and spherical shells - Deformation in thin cylindrical and spherical shells - Biaxial stresses at a point - Stresses on inclined plane - Principal planes and stresses - Mohr's circle for biaxial stresses - Maximum shear stress - Strain energy in bending and torsion.

TOTAL: 60

TEXT BOOKS


REFERENCES

<table>
<thead>
<tr>
<th>MS2404</th>
<th>MATERIALS FOR MOTORSPORT APPLICATION</th>
<th>3 Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOAL</td>
<td>To impart knowledge in selection of materials, applications and testing processes in motorsports.</td>
<td></td>
</tr>
</tbody>
</table>

### Objectives

The course enables the students to

1. Understand the constitutions of alloys and phase diagrams.

2. Impart knowledge on the different types of composite materials, their properties and applications.

3. Understand the polymer matrix composites, different thermoplastic and thermosetting resin, different plastics used in thermosetting.

4. Understand the characteristics and microstructures of various types of cast irons and steels.

5. Understand the ceramics and composites and various types of Ceramic Matrix composites.

6. Understand the phase diagrams of steels and iron carbon systems and various reactions like eutectic, peritectic, eutectoid etc.

7. Understand the mechanical, physical and chemical properties of various metals and its testing methods.

### Outcome

The students should be able to


2. Analyse the classification of steel and cast Iron micro-structure, properties and application.

3. Analyse the Characteristics of polymer matrix composites, Polymer matrix resins like Thermosetting resins and thermoplastic resins and Reinforcement of fibres in polymer matrix composites.

4. Describe the types of Polymers Polymers, commodity and engineering polymers.

5. Describe the some of the plastic forming processes like compression moulding, resin transfer moulding, injection moulding, pultrusion, filament winding.

UNIT - I: PROPERTIES OF MATERIALS

Basic Mechanical, Physical, Chemical and Process characteristics and properties of materials such as Metals, Alloys, Ceramics, Plastics including cost factors.

UNIT - II: HEAT & SURFACE TREATMENT

Definition – Full annealing, stress relief, recrystallisation and spheroidizing – Normalising, hardening and Tempering of steel. Isothermal transformation diagrams – Cooling curves superimposed on I.T. diagram CCR - Hardenability, Jominy end quench test – Austempering, martempering – Case hardening, carburising, nitriding, cyaniding, carbonitriding - Flame and Induction hardening. Electroplating, Galvanizing, Gilding, Glazing, Powder coating, Thin-film deposition

UNIT - III: SELECTION OF MATERIALS

Criteria of selecting materials for various automotive components viz Engine, Drive Train, Chassis, Body panels, etc.

Weighted Property Index.

UNIT - IV: COMPOSITES & CARBON FIBERS

Fibre reinforced composites, Particulate reinforced composites – Basic Production Techniques and properties

Carbon Fibers: Types, Properties & Production Techniques

UNIT - V: FAILURE AND TESTING

Types of Failure such as metal plastic deformation, slip, twinning, creep, fatigue, impact, overstressing, corrosion, temperature, thermal cycling, residual stresses, stress relaxation, degradation, radiation, electrical breakdown


Total: 45

Text Books


References

<table>
<thead>
<tr>
<th>MS2405</th>
<th>TRANSMISSION DRIVES</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To impart knowledge in development of Automotive transmission</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td>The course enables the students to</td>
<td></td>
</tr>
<tr>
<td>1. identify appropriate techniques to troubleshoot and solve problems related to varied automotive systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Apply quantitative reasoning to issues arising from the maintenance of automotive systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Discuss with others issues involving automotive systems (GE NJ 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Outcome</strong></td>
<td>The students should be able to</td>
<td></td>
</tr>
<tr>
<td>1. Analyze the structure and function of automatic transmission systems in use in automobiles.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Investigate maintenance issues arising in automatic transmission systems.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Recognize environmental and safety concerns related to maintenance procedures for automatic transmission systems.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Discuss the theory and operation of automatic transmission components.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Discuss the theory regarding the influence of computer controls on transmission and all wheel drive systems.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
UNIT - I: GEAR BOX

Different types of clutches, principle, Construction and torque capacity.
Gear Box: performance characteristics in different speeds, different types of gear boxes, speed synchronizing devices, gear materials, lubrication.

UNIT - II: HYDRODYNAMIC DRIVE

Fluid coupling: advantages and limitations, construction details, torque capacity, slip in fluid coupling, performance characteristics. Means used to reduce drag torque in fluid coupling.

Principal of torque conversion, single, multi stage and poly-phase torque converters, performance characteristics, constructional and operational details of typical hydraulic transmission drives.

UNIT - III: AUTOMOTIVE TRANSMISSION


UNIT - IV: ELECTRIC DRIVE

Electrical drives: advantages and limitations, Automotive drive concepts, Drive characteristics and driving resistances, Background and function of starting devices, transmissions, hybrid- and electric drives, Design and function of conventional drive concepts, serial, parallel and power-split hybrid drives, electric drives.

UNIT - V: AUTOMATIC TRANSMISSION APPLICATIONS

Automatic transmission: relative merits and demerits when compared to conventional transmission, study of typical automatic transmissions, and automatic control of gear box, Electronically Controlled Transmission. Case study of various Transmissions in Formula, Off road vehicles etc.

Total: 45

Text Books

2. Newton and Steeds - Motor Vehicle- Illiffe Publisher- 2000

Reference

<table>
<thead>
<tr>
<th>MS2411</th>
<th>Automotive Engines and Chassis Components Laboratory</th>
<th>1 Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To impart knowledge in various engine and chassis components</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Objectives</strong></th>
<th><strong>Outcome</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The course enables the students to</td>
<td>The students should be able to</td>
</tr>
<tr>
<td>1. Experience the skill of dismantling and assembling of engines.</td>
<td>1. Completely dismantle and assemble the engines</td>
</tr>
<tr>
<td>2. Have a detailed study about Engine parts</td>
<td>2. Calculate the Engine displacement by measuring the Stroke length, bore.</td>
</tr>
<tr>
<td>3. Determine the dimensions of crankshaft, camshaft, valves etc</td>
<td>3. Visually inspect for wear and tear in the components</td>
</tr>
<tr>
<td>4. Examine the malfunctioning of the system</td>
<td>4. Measure the ovality in crank journals, and cylinder bore and compare with the standard specifications</td>
</tr>
<tr>
<td>5. Understand the mounting of components, the basic working principle of components with the engine for accurate operations.</td>
<td>5. Study the components of cooling systems and lubrication systems, Differentiate the conventional ignition and Electronic ignition system.</td>
</tr>
</tbody>
</table>
LIST OF EXPERIMENTS

1. Dismantling, measurement of various components & Assembling of various petrol & diesel engines.
2. Study of oil filter, fuel filter, fuel delivery system such as carburetor, MPFI, FIP etc
3. Study of ignition system components – coil, magneto and electronic ignition systems.
4. Study of engine cooling system components
5. Study of engine lubrication system components

LIST OF EQUIPMENTS ------- Each 1 No(for a batch of 30 students)

1. Petrol & Diesel Engines of Various Size and Make.
2. Fuel filter, fuel injection pump, injector, carburetor, MPFI component
3. Ignition coil, magneto, electronic ignition system components
4. Water pump, thermostat, radiator, temperature gauge
5. Lubrication oil pump, pressure relief valve, filters, oil pressure gauge, Internal micrometer, external micrometer, dial gauges

List of Experiments:

Study and measurement of the following chassis frames:

1. Heavy duty vehicle frame (Leyland, Tata etc)
2. Light duty vehicle frame (Ambassador, Maruti van etc)

Study, dismantling and assembling of

3. Front Axle
4. Rear Axle
5. Differential
6. Steering systems along with any two types of steering gear box
8. Leaf spring, coil spring, torsion bar spring, Hydraulic shock absorber

Study, Dismantling and Assembling of

9. Clutch assembly of different types
10. Gear Box
11. Transfer case

Total: 45

The List of Equipments ------ Each 1 No (For a Batch of 30 Students)

1. Heavy duty vehicle chassis frame (Leyland or Tata)
2. Light duty vehicle chassis frame
3. Front axle
4. Rear axle
5. Steering system
6. Steering gear box (Rack and pinion, re-circulating ball type)
3. Hydraulic brake system
4. Air brake system
5. Leaf spring, coil spring, torsion bar
6. Hydraulic shock absorber
7. Diaphragm clutch assembly
8. Gear box (light duty, heavy duty)
9. Transfer case
<table>
<thead>
<tr>
<th>MS2412</th>
<th>REVERSE ENGINEERING LAB –I</th>
<th>1 Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To make the students to understand the dismantle, assemble, measure and visualization of a vehicle /component into a virtual models using modelling software such as pro-e/solidworks</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to :</td>
<td>The students should be able to :</td>
<td></td>
</tr>
<tr>
<td>1. Understand the dismantle, assemble, measure and visualization of a vehicle /component into a virtual models</td>
<td>1. TO KNOW the prototype model into virtual design and also can understand various dimensional tolerances.</td>
<td></td>
</tr>
</tbody>
</table>

**THE LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS**

2. Software like Pro-E or CATIA - 30 licenses

**Total: 45**
<table>
<thead>
<tr>
<th>MS2413</th>
<th>MECHANICS OF MATERIALS AND METALLURGY LABORATORY</th>
<th>1 Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To understand the properties of materials and metals and how to measure the same</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the students to</td>
<td>The students should be able to</td>
</tr>
<tr>
<td>1. Gain knowledge on different metals used in mechanical applications.</td>
<td>1. Conduct experiments to find out different properties of metals and alloys</td>
</tr>
<tr>
<td>2. Understand the importance of strength of different components like springs, beams etc</td>
<td>2. Compare the properties of metals before and after the heat treatment.</td>
</tr>
<tr>
<td>3. Understand the heat treatment process which alters the properties of materials.</td>
<td></td>
</tr>
</tbody>
</table>


LIST OF EXPERIMENTS

1. Tension test on metal specimen
2. Double shear test on metal specimen
3. Torsion test on metal specimen
4. Impact test on metal specimen
5. Hardness test on metals – Brinell, Rockwell & Vickers Hardness Number
6. Deflection test on metal specimen
7. Compression test on helical springs
8. Strain Measurement using Rosette strain gauge
9. Effect of hardening- Improvement in hardness and impact resistance of metal specimen
10. Tempering- Improvement Mechanical properties Comparison
   (i) Unhardened specimen
   (ii) Quenched Specimen and
   (iii) Quenched and tempered specimen.

11. Microscopic Examination of
   (i) Hardened samples and
   (ii) Hardened and tempered samples.

1. Izod&Charpy Test

TOTAL: 45

LIST OF EQUIPMENTS

(For a batch of 30 students)

1. Universal Tensile Testing machine with double shear attachment - 40 Ton Capacity - 1 No
2. Torsion Testing Machine (60 NM Capacity) - 1 No
3. Impact Testing Machine (300 J Capacity) - 1 No
4. Hardness Testing Machine - 1 No
5. Spring Testing Machine for tensile and compressive loads (2500 N) - 1 No
6. Metallurgical Microscopes - 3 Nos
<table>
<thead>
<tr>
<th>EE2511</th>
<th>CONTROL SYSTEMS</th>
<th>4 Credits</th>
</tr>
</thead>
</table>

**Goal**  
To familiarize the students with the basic concepts of linear control theory and design of control system.

**Objectives**  
The course should enable the student to

1. Understand the methods of representation of systems and getting their transfer function models.
2. Provide adequate knowledge in the time response of systems and steady state error analysis.
3. Give basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.
4. Understand the concept of stability of control system and methods of stability analysis.
5. (Study the state space analysis)

**Outcome**  
The students should be able to

1. Understand the various methods of representation of systems.
2. Apply time response analysis and to determine steady state error.
3. Analyse the stability of the system using frequency response plots and able to adjust the gain of the system to satisfy the desired specifications.
4. Determine the stability of the system by applying various stability criterion.
5. Design of state space equation in various forms.
UNIT I SYSTEMS AND THEIR REPRESENTATION 12


UNIT II TIME RESPONSE 12


UNIT III FREQUENCY RESPONSE 12

Frequency response – Bode plot – Polar plot. Determination of closed loop response from open loop response – Correlation between frequency domain and time domain specifications.

UNIT IV STABILITY OF CONTROL SYSTEM 12


UNIT V STATE SPACE ANALYSIS 12

Introduction to State Space Analysis – Phase variable and Canonical Forms – State Transition Matrix – Solutions to state space equation – Discretization of state space equation, controllability and observability of systems.

TOTAL 60

TEXT BOOKS

3. Ashish Tewari, ―Modern Control Design with Matlab & Simulink‖, John Wiley, New Delhi 2002

REFERENCES

<table>
<thead>
<tr>
<th>AT2503</th>
<th>AUTOMOTIVE ELECTRICAL AND ELECTRONICS</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To impart knowledge in Automotive Electrical and Electronics</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the student to</td>
<td>The students should be able to</td>
<td></td>
</tr>
<tr>
<td>1 Understand construction and working of batteries and accessories.</td>
<td>1. Describe the working of lead acid battery. The operation of lighting system, Horn and Wiper system</td>
<td></td>
</tr>
<tr>
<td>2 Understand the working of starting system.</td>
<td>2. Describe the condition at starting and behavior of starter during starting and the working and maintenances of starter motor.</td>
<td></td>
</tr>
<tr>
<td>3 Understand the working of charging system</td>
<td>3. Describe the working of different starter drive units and the working of onboard diagnostic system, security and warning system.</td>
<td></td>
</tr>
<tr>
<td>4 Understand the fundamentals of automotive electronics.</td>
<td>4. Describe the shunt generator characteristics, working of alternators and bridge rectifiers. Aware of current trends in automotive electronics engine management system.</td>
<td></td>
</tr>
<tr>
<td>5 Understand the working of sensors activators</td>
<td>5. Describe the working of speed sensor, throttle position sensor, exhaust oxygen level sensor, manifold pressure sensor, crankshaft position sensor, coolant temperature sensor, air mass flow sensor. The working of solenoids, stepper motors and relays.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT - I: BATTERIES AND ACCESSORIES
Principle and construction of lead acid battery, characteristics of battery, rating capacity and efficiency of batteries, various tests on batteries, maintenance and charging. Lighting system: insulated and earth return system, details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator.

UNIT - II: STARTING SYSTEM
Condition at starting, behavior of starter during starting, series motor and its characteristics, principle and construction of starter motor, working of different starter drive units, care and maintenances of starter motor, starter switches.

UNIT - III: CHARGING SYSTEM
Generation of direct current, shunt generator characteristics, armature reaction, third brush regulation, cutout, Voltage and current regulators, compensated voltage regulator, alternators principle and constructional aspects and bridge rectifiers, new developments.

UNIT - IV: FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS
Current trends in automotive electronic engine management system, electro magnetic interference suppression, electromagnetic compatibility, electronic dashboard instruments, onboard diagnostic system, security and warning system.

UNIT - V: SENSORS AND ACTUATORS
Types of sensors: sensor for speed, throttle position, exhaust oxygen level, manifold pressure, crankshaft position, coolant temperature, exhaust temperature, air mass flow for engine application. Solenoids, stepper motors, relay.

Total: 45

Text Books

References
<table>
<thead>
<tr>
<th>MS3501</th>
<th>BASICS OF VEHICLE DYNAMICS</th>
<th>4 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Goal</strong></td>
<td><strong>Outcome</strong></td>
</tr>
<tr>
<td></td>
<td>To impart knowledge in Dynamic characteristics of vehicles.</td>
<td>The students should be able to</td>
</tr>
<tr>
<td></td>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
</tr>
<tr>
<td>The course enables the students to</td>
<td>The students should be able to</td>
<td></td>
</tr>
<tr>
<td>1. Enhance the knowledge in vibration of vehicles due to dynamic conditions.</td>
<td>1. Perceive the significance of Vibration analysis.</td>
<td></td>
</tr>
<tr>
<td>2. Grasp the importance of the comfort and safe riding characteristics.</td>
<td>2. Analyze the reactions of each wheels subjected to various loads. And the stability of the vehicles for various road conditions.</td>
<td></td>
</tr>
<tr>
<td>3. Understand the vehicle performance parameters and various testing methodologies.</td>
<td>3. Calculate tractive effort and reactions for different drives and solve problems based on vehicle handling characteristics</td>
<td></td>
</tr>
<tr>
<td>4. Understand the effects ride characteristics over the stability of vehicles.</td>
<td>4. Acquire knowledge over the influence of performance parameters on ride characteristics.</td>
<td></td>
</tr>
<tr>
<td>5. Determine fundamental frequency for coupled system.</td>
<td>5. Apply Dunkerley’s and Rayleigh’s methods for determining fundamental frequency.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT - I: MECHANICAL VIBRATION

Single degree of freedom, two degree of freedom, free, forced and damped vibrations modeling and simulation studies, model of an automobile, magnification factor, transmissibility, vibration absorber.

UNIT – II: PERFORMANCE CHARACTERISTICS


UNIT – III: RIDE & HANDLING

Human response to Vibration, Vehicle Ride models, Introduction to Random vibration.

Steady state handling characteristics of a two axled vehicle, Steady state response, Testing of handling characteristics, Transient Response characteristics, Directional Stability.

UNIT – IV: STEERING & SUSPENSION

Steering Linkages, steering geometry error, front wheel geometry, steering system forces & moments, steering system models, example of steering system effects, influence of front wheel drive, four wheel steer.

Anti – squat, Anti – pitch, Anti -dive suspension geometry, Roll Center Analysis – Dependent & Independent suspension, Active & Semi- Active suspension systems.

UNIT - V:NUMERICAL METHODS

Approximate methods for determining fundamental frequency, Modal analysis, Dunkerleys lower bound, Rayleighs upper bound, Holzer method for closed coupled system and branched system.

TOTAL: 60

TEXT BOOKS:


References

<table>
<thead>
<tr>
<th>MS3502</th>
<th>Motorsport Vehicle Analysis</th>
<th>4 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To understand the principles involved in discretization and finite element approach and to learn to form stiffness matrices and force vectors for simple elements</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The subject should enable the students to:</td>
<td>The students should be able to apply:</td>
<td></td>
</tr>
<tr>
<td>1. Understand the basics of Engineering problems, Mathematical modeling of FEA</td>
<td>1. The various engineering problems, formulate mathematical modeling and know engineering applications of FEA.</td>
<td></td>
</tr>
<tr>
<td>2. Understand the finite element formulations of Boundary Value problems.</td>
<td>2. Statement, Comparisons, Piecewise continuous trial functions like a bar finite element.</td>
<td></td>
</tr>
<tr>
<td>3. Understand ONE dimensional FEA</td>
<td>3. General form of total potential for 1-D applications, Generic form of finite element equations</td>
<td></td>
</tr>
</tbody>
</table>
UNIT I FINITE ELEMENT FORMULATION OF BOUNDARY VALUE PROBLEMS


UNIT II ONE DIMENSIONAL FINITE ELEMENT ANALYSIS


UNIT III FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL AND TWO DIMENSIONAL PROBLEMS


UNIT IV DYNAMIC ANALYSIS USING FINITE ELEMENT METHOD


UNIT V ANALYSIS PROCEDURE

Analysis Procedure for Roll Cage, Gear Box, Transmission Shafts, Knuckle, Rotors, Brake pad etc. (Systematic problem approach)

TOTAL: 60 PERIODS

TEXT BOOK:

REFERENCE BOOKS:
<table>
<thead>
<tr>
<th>MS3503</th>
<th>ETHICS IN ENGINEERING AND SOCIETY</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To create an awareness of engineers on engineering ethics and moral values in the society</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The subject should enable the student to</td>
<td>The students should be able to know :</td>
<td></td>
</tr>
<tr>
<td>1. Understand ethical questions and constraints</td>
<td>1. Decision making process of both the organisation and the individual.</td>
<td></td>
</tr>
<tr>
<td>2. Understand an environmental legislation and issues</td>
<td>2. The tackle of business</td>
<td></td>
</tr>
<tr>
<td>4. Understand new product introduction process</td>
<td>4. Emerging technologies</td>
<td></td>
</tr>
<tr>
<td>5. Understand the concurrent Engineering and Innovative organisations</td>
<td>5. Organizational creativity and relationship with individual.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT I Ethical questions and constraints

How ethics effects the decision making process of both the organisation and the individual, within the global market places.

UNIT II Environmental Legislation and Issues

What the current legislation is and how it effects, business and the markets they operate in plus the underlying issues and how they can be tackled.

UNIT III Innovation, design and corporate strategy

Innovation strategies and firm culture: Company goals, plans and strategies: The return on investment in R&D and Design: The problem of co-ordination.

UNIT IV Emerging technologies in the new product introduction process

Time compressed technologies (rapid prototyping, rapid tooling etc.): Design visualisation technologies (virtual reality etc.): Computer technologies: Engineering Data Management.

UNIT V Concurrent Engineering and Innovative organizations

Where it come from and where is it now: Structures and processes: People Issues: Learning the lessons - Organizational strategies and practices for innovation. Organizational creativity and its relationship with individual creativity.

Total : 45

TEXT BOOKS


REFERENCES

2. Presentation and Data projection facilities.
<table>
<thead>
<tr>
<th>AT2531</th>
<th>AUTOMOTIVE ELECTRICAL AND ELECTRONICS LABORATORY</th>
<th>1 Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal</td>
<td>To get the practical knowledge about different automobile electrical and electronic circuits.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the students to</td>
<td>The students should be able to</td>
</tr>
<tr>
<td>1. Understand battery testing and maintenance</td>
<td>1. Describe the testing procedure maintenance of the battery.</td>
</tr>
<tr>
<td>2. Understand the testing of starting motors and generators.</td>
<td>2. Conduct high discharge test and specific gravity test in a battery using voltage tester and hydrometer.</td>
</tr>
<tr>
<td>3. Understand the testing of regulators and cut-outs relay.</td>
<td>3. Describe the working of starter motor.</td>
</tr>
<tr>
<td>4. Understand the diagnosis of ignition system faults.</td>
<td>4. Describe the working of regulators and cut-outs relay.</td>
</tr>
<tr>
<td>5. Understand the study of automobile electrical wiring.</td>
<td>5. Describe the working of ignition system and to know the diagnosis of ignition system.</td>
</tr>
<tr>
<td>6. Understand the study of rectifiers and filters.</td>
<td>6. Describe the various electrical circuits in a vehicle.</td>
</tr>
<tr>
<td>7. Understand the study of logic gates, adder and flip-flops.</td>
<td>7. Construct the rectifier circuit using diodes and to know about the necessity in automobiles.</td>
</tr>
<tr>
<td>8. Understand the study of SCR and IC timer.</td>
<td>8. Verify various logic gates truth table by using logic gate kit.</td>
</tr>
<tr>
<td>10. Understand microcontroller programming and interfacing.</td>
<td>10. Get the analog to digital conversion by using microcontroller kit and interface stepper motor to microcontroller kit and control the speed of the stepper motor by using program.</td>
</tr>
</tbody>
</table>
LIST OF EXPERIMENTS:

a. Electrical Laboratory

1. Testing of batteries and battery maintenance
2. Testing of starting motors and generators
3. Testing of regulators and cut – outs relay
4. Diagnosis of ignition system faults
5. Study of automobile electrical wiring

b. Electronics Laboratory

6. Logic gates, Adders, Flip flops
7. SCR and IC Timers
8. Interfacing seven segment displays
9. Study of Microprocessor and Microcontrollers
10. Interfacing Sensors like RTD, LVDT, Load Cell etc.
11. Interfacing ADC for Data Acquisition
12. Interfacing DAC for Control Application
13. Interfacing Actuators
14. Micro controller programming and interfacing

THE LIST OF EQUIPMENTS - Each 1 No (For A Batch of 30 Students)

i. Battery, hydrometer, voltage tester
ii. Starter motor, regulator, cutout
iii. Distributor, ignition coil, spark plug
iv. Auto electrical wiring system
v. Rectifiers, filters
vi. Amplifier
vii. IC timer
viii. Data logger

Total: 45
<table>
<thead>
<tr>
<th>EE2241</th>
<th>CONTROL SYSTEMS LABORATORY</th>
<th>1 Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To provide a platform for understanding the basic concepts of linear control theory and its application</td>
<td></td>
</tr>
</tbody>
</table>

**Objectives**

<table>
<thead>
<tr>
<th>The course will enable the students to</th>
<th><strong>Outcome</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Determine the transfer function parameters of AC servomotor.</td>
<td>The students should be able to know:</td>
</tr>
<tr>
<td>(ii) Simulate type-0 and type-1 system.</td>
<td>At the end of the course, the student should be able to</td>
</tr>
<tr>
<td>(iii) Simulate linear systems and non-linear systems using digital simulation.</td>
<td>(i) Understand the transfer function parameters for any type of system</td>
</tr>
<tr>
<td>(iv) Design of P, PI and PID controllers.</td>
<td>(ii) Understand and simulate (Digital and Analog) time response characteristics of type-0 and type-1 system</td>
</tr>
<tr>
<td>(v) Learn Stability analysis of linear systems.</td>
<td>(iii) Understand and design linear and nonlinear Systems</td>
</tr>
<tr>
<td></td>
<td>(iv) Understand the stability analysis of the linear system using Bode / Root locus and Nyquist plot.</td>
</tr>
</tbody>
</table>

**LIST OF EXPERIMENTS**

LIST OF EXPERIMENTS FOR CONTROL SYSTEMS:

1. Determination of transfer function parameters of AC servomotor
2. Analog simulation of type-0 and type-1 system.
3. Digital simulation of linear systems and non-linear systems
4. Design and implementation of compensators.
5. Design of P, PI and PID controllers.

\[ P = 45 \text{ TOTAL} = 45 \]
<table>
<thead>
<tr>
<th>MS3511</th>
<th>Motorsport Vehicle Analysis Laboratory</th>
<th>1 Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To provide a platform for understanding the basic concepts of analysis of the vehicles components by numerical investigations.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td>The course will enable the students to (i) Determine structural analysis of the subsystems of the vehicle using FEA</td>
<td><strong>Outcome</strong></td>
</tr>
<tr>
<td></td>
<td>The students should be able to know: At the end of the course, the student should be able to (i) Understand the concepts of analysis procedures of the vehicle sub systems &amp; components and interpreting the results for the validation.</td>
<td></td>
</tr>
</tbody>
</table>

To analyse vehicle subsystem / components by using analysis software like ANSYS / NASTRAN / ABACUS etc.,

**Total: 45**
Goals

The students will be able to understand the basics of vibration characteristics of the mechanical and Automotive components

Objectives

The course should enable the student to:

1. Testing of natural frequency.
3. Whirling of Shafts.

Outcome

The students should be able to know:

1. the natural frequency of the given material
2. Using various sensors to find displacement, Velocity and acceleration
3. Using circular rod to find its maximum permissible location of bending while it is getting rotated.
4. Using circular rod to find its maximum permissible location of bending while it is getting rotated from its axis shift from original axis.
5. Using wheel alignment equipments to find a front wheel geometry of Toe in/out, Caster, Camber/King Pin Inclination and Included angle.

LIST OF EXPERIMENTS:

1. Testing of natural frequency of various components
2. Measurement of displacement velocity and acceleration
3. Whirling of Shafts
4. Critical Speed Determination
5. Measurement of Front Wheel Geometry

THE LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

a. Quarter/ half/ four Wheeler Chassis Dynamometer - 1 No.
b. Shock absorber test rig - 1 No.
c. Sensors – Displacement, Velocity and acceleration - 1 No.
d. DAQ system - 1 No.

Total: 45
<table>
<thead>
<tr>
<th>MS2601</th>
<th>PERFORMANCE TUNING OF RACING ENGINES</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>The aim of this module is to provide a comprehensive introduction towards tuning of racing engines</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Objectives</strong></th>
<th><strong>Outcome</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the student to</td>
<td>Upon completion, the student should be able to</td>
</tr>
<tr>
<td>1. Learn the basics of the engines working components.</td>
<td>1. The opportunity to know the engines better.</td>
</tr>
<tr>
<td>2. Learn about the various performance aspects of the engine</td>
<td>2. The understanding of the performance needs of the motorsports</td>
</tr>
<tr>
<td>3. The impact of the cylinder filling and the charge induction.</td>
<td>3. Impact of the components on the working aspects of the engine</td>
</tr>
<tr>
<td>4. The designing abilities of the intake and the exhaust</td>
<td>4. Knowing the combustion and induction systems at the motorsports</td>
</tr>
<tr>
<td>5. Understanding the various combustion characteristic.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT I INTRODUCTION

Engine Design features-Bore dia, stroke Length, Con rod-crank ratio, no and arrangement of cylinders, overall engine dimensions, compression ratio, piston, Connecting Rod, Crank Shaft, Cam Shaft design, use of emerging technologies in engine design, new materials, balancing, valve geometry.

UNIT II ENGINE PERFORMANCE CHARACTERISTICS, MAPPING AND PERFORMANCE CURVES

Torque, power (IP & BP), mechanical, thermal and volumetric efficiency, mep, sfc, emission control assessment.

Effect of Injection timing, Influence of Spark Advanced / Retarder on engine power emissions, Graphical account of the role of map data, mapping procedure, visual interpretation of a fuel map and ignition map, for different engine performance applications like economy, power, torque etc., Curves for SI/CI and pressure charged, rotary engines, engine test at various speeds, critical evaluation of a/f ratio, T, P, CC, FC, significance of the standards used to measure engine power BSAU/DIN/SAE/EEC, application of engine performance curves and design to the selection of appropriate power units for specific tasks.

UNIT III INTAKE DESIGN AND CYLINDER FILLING

General requirements- eliminatory interferences- long branches- duct length- individual pipe- pipe shape- varying diameter- diffuser shape- designers comments- fact and fancy- combined systems-manifold pressure- triumph- Vauxhall design. Flow through inlet valve- cylinder pressure- manifold pressure- individual duct- air intake length- combined ramming.

UNIT IV INTAKE & EXHAUST DESIGN MODIFICATION

Propagation of sound waves and its importance- pressure phenomena and its application includes- resonance, pressure in long pipe and independence of vibration.

Silencer design and considerations- sound reduction- tail pipe size- silencing motorcycle type engines- back pressure silencer and testing methods with further experiments.

UNIT V NUMERICAL ANALYSIS

Numerical analysis techniques of flow and combustion characteristics of an engine using FEA/CFD softwares, methodology, procedures constraints

Textbook


Total: 45
<table>
<thead>
<tr>
<th>MS2602</th>
<th>PROJECT MANAGEMENT</th>
<th>3 Credits</th>
</tr>
</thead>
</table>

**Goal**

To understand the implementation and execution of the project and its evaluation techniques.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The subject should enable the students to:</td>
<td>The students should be able to know:</td>
</tr>
<tr>
<td>1 Be able to formulate a project</td>
<td>1 To develop learners’ skills of independent enquiry by undertaking a sustained investigation of direct relevance to their vocational, academic and professional development.</td>
</tr>
<tr>
<td>2 Be able to implement the project within agreed procedures and to specification</td>
<td></td>
</tr>
<tr>
<td>3 Be able to evaluate the project outcomes</td>
<td></td>
</tr>
<tr>
<td>4 Be able to present the project outcomes. Learning outcomes and assessment criteria</td>
<td></td>
</tr>
</tbody>
</table>
UNIT 1: PROJECT FORMULATION

Research and review areas of interest; literature review; methods of evaluating feasibility of projects, initial critical analysis of the outline specification, selection of project option, initiating a project logbook/diary, estimating costs and resource implications, identifying goals and limitations, value of project, rationale for selection, agree roles and allocate responsibilities.

Developing and structuring a list of requirements relevant to project specifications such as costs, timescales, scale of operation, standards, legislation, ethics, sustainability, and quality, fitness-for-purpose, business data, and resource implications.

UNIT 2: PROCEDURES & PLAN

Planning and monitoring methods, operating methods, lines of communication, risk analysis, structure of groups and collaborative working such as learner groups or roles and responsibilities within a work-based project, targets and aims.

Production of a plan for the project including timescales, deliverables, milestones, quality assurance systems and quality plans, and monitoring progress.

UNIT 3: PROJECT IMPLEMENTATION

Proper use of resources, working within agreed timescale, use of appropriate techniques for generating solutions, monitoring development against the agreed project plan, maintaining and adapting project plan.

Systematic recording of relevant outcomes of all aspects and stages of the project to agreed standards.

UNIT 4: PROJECT EVALUATION

Detailed analysis of results, conclusions and recommendations, critical analysis against the project specification and planned procedures, use of appropriate evaluation techniques, application of project evaluation and review techniques (PERT), opportunities for further studies and developments.

Use of appropriate techniques to justify project progress and outcomes in relation to the original agreed project specification. Further consideration: significance of project; application of project results; implications; limitations of the project; improvements; recommendations for further consideration.

UNIT 5: PROJECT PRESENTATION

Record of procedures and results: relevant documentation of all aspects and stages of the project.
Format: professional delivery format appropriate to the audience; use of appropriate media.

Text Books:


References:

<table>
<thead>
<tr>
<th>MS2603</th>
<th>RACING TWO WHEELERS</th>
<th>3 Credits</th>
</tr>
</thead>
</table>

**Goal**

The aim of this subject is to make the students to know and understand the constructional details operating characteristics and vehicle design aspects.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the students to</td>
<td></td>
</tr>
<tr>
<td>1. Understand the Two stroke SI engine, four stroke SI engine; merits and demerits. Symmetrical and unsymmetrical port timing diagrams.</td>
<td></td>
</tr>
<tr>
<td>2. understand the Types of scavenging processes, Fuel system, Lubrication system. Magneto coil and battery coil spark ignition system.</td>
<td></td>
</tr>
<tr>
<td>3. understand the construction and working of electronic ignition system, starting system; kick starter system.</td>
<td></td>
</tr>
<tr>
<td>4. understand the types of clutches, gear box and shock absorbers etc.</td>
<td></td>
</tr>
<tr>
<td>5. understand the types of brakes, wheels, tyres and tubes.</td>
<td></td>
</tr>
<tr>
<td>6. understand the constructions and case studies of two and three wheelers and maintenance of vehicles.</td>
<td></td>
</tr>
<tr>
<td>The students should be able to</td>
<td></td>
</tr>
<tr>
<td>1. Differentiate various layouts, analyze the merits and limitations and apply in real time. Dismantle study, perform corrections and assemble the various parts of the vehicle.</td>
<td></td>
</tr>
<tr>
<td>2. Describe the maintenance procedures of various systems like steering systems, braking system, suspension system and engine etc.</td>
<td></td>
</tr>
<tr>
<td>3. Dismantle study, rectify and assemble drive line system, final drive and differential, rear axle, wheels and tires, suspension and brake systems.</td>
<td></td>
</tr>
<tr>
<td>4. Realize effects of maintenance and minimize the consumption of petroleum based fuels.</td>
<td></td>
</tr>
<tr>
<td>5. Describe the maintenance procedures of various electrical systems like battery, starter motor, alternator, D.C motor etc.</td>
<td></td>
</tr>
<tr>
<td>6. Be familiar with maintenance procedures of engine, cooling system and lubrication system, checking and servicing of dash board instruments. Be familiar with wheel alignment, computerized alignment and wheel balancing, and door locks and window glass actuating system maintenance.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT - I: POWER UNIT


UNIT - II: CHASSIS, BRAKES AND TYRES

Frames & Body: Types of frame, construction, loads, design consideration, materials, Regulations, aerodynamic, aesthetic & ergonomics considerations for body work.

Types of Brakes, Front and rear brake links, Layouts. Spooked wheel, Cast wheel, Disc wheel, Disc types. Tyres and tubes. Working system of ABS and EBD.

UNIT - III: STEERING & SUSPENSION

Steering geometry, influence of steering system, steering column construction.

Suspension requirements, design considerations, trailing & leading link, swinging arm, springs & shock absorbers.

UNIT - IV: TRANSMISSION SYSTEMS

Clutch – special requirements, different types, need of primary reduction, selection of transmission - gear transmission, gear shift mechanism, belt transmission, automatic transmission such as CVT, final drive, wheel drive arrangement, drive by wire.

UNIT - V: PERFORMANCE & MAINTENANCE

Road Performance: Handling characteristics, driver & pillion seating arrangement, ergonomics & comfort, road holding & vehicle stability, riding characteristics, safety arrangements, special requirements.

Maintenance: Preventive & brake down maintenance, factors affecting fuel economy & emission.

Total: 45

Text Book


References

<table>
<thead>
<tr>
<th>MS2604</th>
<th>VEHICLE DYNAMICS - TESTING &amp; CONTROL</th>
<th>4 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>The aim of this subject is to make the students to know and understand the vehicle dynamics and control.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>1. This subject introduces students to the dynamic aspect of the vehicle.</td>
<td>The students should be able to</td>
<td></td>
</tr>
<tr>
<td>2. Enable the students to understand the how the dynamic properties of one element can affect the others</td>
<td>1. Know the dynamics of the vehicle.</td>
<td></td>
</tr>
<tr>
<td>3. It give the students a flavor of the design and development of the race vehicle</td>
<td>2. Appreciate the tools available for solving the problems in the vehicle dynamics.</td>
<td></td>
</tr>
<tr>
<td>4. Strengthens the concepts on the vehicle test control systems and the testing methods</td>
<td>3. Appreciate the problems associated with the vehicle development</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Use the various vehicle testing methods to extract the maximum performance.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT-1 : TYRE CHARACTERISTICS 12

Tyre Rating, Terminology & Axis system, Cornering properties, Camber thrust, Tyre forces & Moments, Rolling Resistance, Tractive Effort & Longitudinal Slip, Performance of Tyres in Wet surfaces, Ride properties, Tyre Vibrations.

UNIT – 2: AERODYNAMICS 12


UNIT – 3: VEHICLE DYNAMICS DEVELOPMENT & RACE CAR DESIGN 12


UNIT – 4: CHASSIS SETUP, DEVELOPMENT & TESTING 12


UNIT – 5:CONTROL SYSTEM TECHNIQUES 12

Control system techniques frequency domain analysis, robust control design, root locus, optimal control, online parameter identification, control of nonlinear systems and adaptive control.

TEXT BOOKS:

Total : 60

b. J.Y.Wong, —Theory of Ground Vehicles’, Wiley Publishers
c. Millikan & Millikan, — Race Car vehicle Dynamics, SAE

REFERENCES

<table>
<thead>
<tr>
<th>AT2603</th>
<th>AUTOMOTIVE CHASSIS DESIGN</th>
<th>4 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To Understand The Fundamental Principles Involved In Design Of The Components Of Automotive Chassis</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the student to</td>
<td>Upon completion, the student should be able to</td>
<td></td>
</tr>
<tr>
<td>1. Learn design calculation of various types of clutches.</td>
<td>1. Apply the knowledge gained through various design of clutches for modifications.</td>
<td></td>
</tr>
<tr>
<td>1. Understand the performance of vehicles and design of gear box.</td>
<td>2. Deal with the performance of vehicles and design of gear box.</td>
<td></td>
</tr>
<tr>
<td>2. Study various loads, moments and stresses on frame members and suspensions.</td>
<td>3. Be familiar with various types of loads, stresses acting on frame and suspension of vehicles.</td>
<td></td>
</tr>
<tr>
<td>3. Learn the details about front axle and steering systems.</td>
<td>4. Be familiar with design of front axle and steering systems.</td>
<td></td>
</tr>
<tr>
<td>4. Understand the design of final drive and rear axle.</td>
<td>5. Deal with design of final drive and rear axle.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT - I:  CLUTCH DESIGN CALCULATION  12

Design of single plate clutch, multi plate clutch, design of centrifugal clutch, cone clutch, energy
dissipated, torque capacity of clutch, design of clutch components, design details of roller and sprag
type of clutches

UNIT - II: GEAR BOX  12

Performance of vehicle, total resistance to motion, traction and tractive effort, acceleration, calculation of
gear ratio, design of three speed gear box, design of four speed gear boxes.

UNIT - III: VEHICLE FRAME AND SUSPENSION  12

Study of loads, moments and stresses on frame members, computer aided design of frame for passenger
and commercial vehicles, computer aided design of leaf springs, coil springs and torsion bar springs.

UNIT - IV: FRONT AXLE AND STEERING SYSTEMS  12

Analysis of loads, moments and stresses at different sections of front axle, determination of loads at
kingpin bearings, wheel spindle bearings, choice of bearings, determination of optimum dimensions and
proportions for steering linkages ensuring minimum error in steering.

UNIT - V: FINAL DRIVE AND REAR AXLE  12

Design of propeller shaft, design details of final drive gearing, design details of full floating, semi-floating
and three quarter floating rear shafts and rear axle housings.

Total: 60

Text Books


References

<table>
<thead>
<tr>
<th>AT2604</th>
<th>AUTOMOTIVE SAFETY</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal</td>
<td>The student will be able to know about the various safety aspects and safety components in the vehicle for the safety of the driver, passengers and the pedestrians.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to: 1. Know about the basics about the vehicle. 2. Understand the safety aspects in the vehicle. 3. Know and understand the various safety aspects. 4. To get the knowledge in sensors provided in the vehicle to avoid the crash and to detect the defects in the vehicle. 5. To know about the comfort and convenience system.</td>
<td>The students should be able to 1. Know about the design of the bumper for safety. 2. Know about the concept of crumble zone, and also the effect of acceleration and deceleration of the vehicle in the compartment of the vehicle. 3. Know the various types of safety aspects such as active and passive safety, the active safety components and the working passive safety components such as air bags, seat belts. 4. Know the working of the compartment while moving of the vehicle, about the collapsible steering and tiltable steering column, about the collision avoidance system, front and rear object detection. 5. Know about the rear vehicle detection system, and the braking system, the comfort and convenience system for the vehicle such as central locking system, garage door opening system and about the environment information system.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT – I INTRODUCTION

Design of the body for safety, energy equation, engine location, deceleration of vehicle inside passenger compartment, deceleration on impact with stationary and movable obstacle, concept of crumble zone, safety sandwich construction.

UNIT – II SAFETY CONCEPTS

Active safety: driving safety, conditional safety, perceptibility safety, operating safety- passive safety: exterior safety, interior safety, deformation behaviour of vehicle body, speed and acceleration characteristics of passenger compartment on impact.

UNIT – III SAFETY EQUIPMENTS

Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, tiltable steering wheel, air bags, electronic system for activating air bags, bumper design for safety.

UNIT – IV COLLISION WARNING AND AVOIDANCE

Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions.

UNIT – V COMFORT AND CONVENIENCE SYSTEM

Steering and mirror adjustment, central locking system, Garage door opening system, tyre pressure control system, rain sensor system, environment information system

Total: 45

Text Book


References

1. J.Powloski - —Vehicle Body Engineering
Engine Tuning Lab

1. Tuning of intake and exhaust manifold,
2. Variation in injection timing, valve timing, spark timing, crankshaft angle.
3. ECU mapping of fuel injector, air flow, exhaust flow and cooling temp. etc.,

Total: 45
Goals
The students will be able to understand the basics of vibration characteristics of the mechanical and Automotive components as well as to know about Mathematical software and MBS software.

Objectives
The course should enable the student to:
1. Measurement of displacement, velocity and acceleration.
2. Introduction to MATLAB-SIMULINK, solving simple MCK problems.
3. Conversion of Analog to Digital and Digital to Analog.
4. Study of LS Dyna / Adams / CARSIM.

Outcome
The students should be able to know:
1. Using various sensors to find displacement, Velocity and acceleration.
2. Using data card to find D/A to A/D convertor
3. Using Multi Body dynamics software to solve simple Car model and analyse.

LIST OF EXPERIMENTS:

1. Measurement of displacement velocity and acceleration.
2. Introduction to MATLAB-SIMULINK, solving simple MCK problems
3. Conversion of Analog to Digital and Digital to Analog
4. Using Multi Body dynamics software to solve simple Car model and analyse

THE LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

a. Quarter/ half/ four Wheeler Chassis Dynamometer - 1 No.
b. Sensors– Displacement, Velocity and acceleration - 1 No.
d. DAQ - 1 No.
e. MAT Lab Software -15 Users
f. Adams / L.S. Dyna/ CARSIM -30 Users

Total: 45
MS3613 Design and Fabrication of RC Cars

Students must design and fabricate the Remote Controlled Car in the University and test it under various conditions entails with report submission and viva voice.

AT2634 - Comprehensive Viva Voce

A student will have to appear at the Comprehensive Viva-Voce examination of all the subjects covering the whole syllabus before a board of examiners including an external expert.
<table>
<thead>
<tr>
<th>ME2757</th>
<th>COMPUTATIONAL FLUID DYNAMICS</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To expose the students to numerical methods and to solve complex problems in fluid flow and heat transfer analysis using software.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Objectives</strong></th>
<th><strong>Outcome</strong></th>
</tr>
</thead>
</table>
| The course should enable the students to  
1. Introduce numerical modeling and its role in the field of heat transfer and fluid flow.  
2. Enable the students to understand the various discretization methods and solving methodologies.  
3. Create confidence to solve complex problems in the field of heat transfer and fluid dynamics by using high speed computers.  
4. Understand the process of converting the PDE to difference equations using various discretization techniques. | The students should be able to  
1. Know the equations governing fluid flow and heat transfer.  
2. Appreciate the tools available for solving the algebraic equations.  
3. Appreciate the problems associated with discretization of incompressible flow  
UNIT I GOVERNING EQUATIONS AND BOUNDARY CONDITIONS


UNIT II DISCRETISATION AND SOLUTION METHODOLOGIES


UNIT III HEAT CONDUCTION

Finite difference and finite volume formulation of steady/transient one-dimensional conduction equation, Source term linearization, Incorporating boundary conditions, Finite volume formulations for two and three dimensional conduction problems.

UNIT IV CONVECTION AND DIFFUSION

Finite volume formulation of steady one-dimensional convection and Diffusion problems, Central, upwind, hybrid and power-law schemes - Discretisation equations for two dimensional convection and diffusion.

UNIT V CALCULATION OF FLOW FIELD

Representation of the pressure - Gradient term and continuity equation - Staggered grid - Momentum equations - Pressure and velocity corrections - Pressure - Correction equation, SIMPLE algorithm and its variants. Turbulence models: mixing length model, Two equation (k-? models.

TOTAL: 45

TEXT BOOKS


REFERENCES


UNIT I FORCES, EFFECT OF FRICTION & VEHICLE COLLISION

Understand the forces acting on a vehicle when in motion and during a collision. Forces and motion: applications of mass, weight, force, Newton's Laws of motion and equations of motion on a moving vehicle; determination and effect of tractive effort and tractive resistance.

**Effect of friction**: definition of friction and the co-efficient of friction; factors affected eg skidding, sliding, rolling; calculations eg to determine stopping distances, cornering speeds, effects of gradient, rolling and air friction; deceleration and braking theory; brake efficiency; brake ratio.

**Vehicle collision**: Collision with moving and stationary bodies; principle of conservation of momentum; principle of conservation of energy; calculation of impact speeds; interpretation of projective behaviour of objects projected from a vehicle on impact; load transfer.

UNIT II BRAKES AND ITS BEHAVIOUR

Understand the influence of vehicle brake characteristics on the behaviour of a vehicle. Types of brake...
circuits: single line braking circuit; front and rear split circuit; diagonally split circuit; H-split; L-split; full dual circuit; air/hydraulic circuits; air brake circuits; Types of pressure valves: pressure limiting valves; load sensing valve; inertia sensing valve

Characteristics of brake fluid: types of fluid; constituents; contamination boiling point; vapour lock point

Brake defects: braking faults eg effect of air in brake fluid, temporary loss of breaking, air contamination, heat soak, uneven braking, brake fade, drum expansion

Legal requirements: legal requirements with respect to hydraulic and air braking systems eg the design and use of braking systems are governed by two sets of regulations, the Construction and Use regulations OF ARAI standards

UNIT III Tyre behaviour and characteristics

Understand the influence of vehicle tyre characteristics on the behaviour of a vehicle Tyre markings: car and truck markings; nominal rim diameter; nominal section width; overall diameter; section height; load index; speed index; nominal aspect ratio; load capacity Vehicle handling and tyrebehaviour: slip angle; self-aligning torque; cornering force; centrifugal force; cornering power; instantaneous centre; neutral steer; understeer; oversteer; effects of fault suspension dampers on vehicle handling

Factors affecting adhesion: co-efficient of friction; effect on adhesion as retardation is increased on various types of surface and weather conditions; skidding; aquaplaning Tyre defects: under inflation; over inflation; lumps; bulges; casing break-up; cuts; exposed cords; inspection of tyre valve; reasons for tyre blow-out; effects of impact or concussion damage

UNIT IV Accident reconstruction techniques

Tyre marks and vehicle damage: skid marks; scuff marks; deceleration scuff and tyre prints; debris; secondary impact; vehicle position before and after impact

Accident scene construction plans: the immediate scene, intermediate scene, extended scene; sketch plans and scale plans; triangulation, base line and offsets; use of computer software eg CAD

Unit V Damage Assessment and Cost Evaluation

Damage assessment: vehicle details; vehicle condition; body repair; mechanical components; geometry; production of damage assessment report; post-repair inspection

Repair costing: Thatcham repair times; manufacturers’ repair times; computer estimating; paint and materials; cash in lieu of repairs

Repair methods and materials: suitability of repair methods; vehicle construction; materials used in vehicle construction; method and types of joining; plastic repairs

Total: 45

Reference

1. Vehicular Accident Investigation and Reconstruction, Donald J Van Kirk CRC Press, 01-Jan-2002 - Law - 512 pages

2. ACCIDENT INVESTIGATION IN THE PRIVATE SECTOR - Volume One, Two and Three By Jack Murray, M.B.A., C.L.I., C.F.E.


<table>
<thead>
<tr>
<th>EE2711</th>
<th>ELECTRONICS IN MOTOR SPORTS ENGINEERING</th>
<th>3 Credits</th>
</tr>
</thead>
</table>

**Goal**

This unit will develop learners’ understanding of vehicle electrical and electronic systems, circuits and components and will develop the skills needed to carry out tests, find faults and repair systems.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The course should enable the students to make increasing use of electronic circuitry in motor vehicle control systems has contributed to advances in safety, comfort and economy.</td>
<td></td>
</tr>
<tr>
<td>2. New applications, often incorporating microprocessor hardware, continue to be introduced.</td>
<td></td>
</tr>
<tr>
<td>3. It is thus essential for motor vehicle engineers to be familiar with the operation of electronic circuits and methods of fault diagnosis.</td>
<td></td>
</tr>
<tr>
<td>4. Learning outcome 1 will provide learners with knowledge of electronic principles, circuit components and test procedures.</td>
<td></td>
</tr>
<tr>
<td>5. In learning outcome.</td>
<td></td>
</tr>
<tr>
<td>6. Learners are introduced to the various types of sensors, actuators and display units used in motor vehicle control and driver information systems.</td>
<td></td>
</tr>
<tr>
<td>7. Learning outcome provides knowledge of microprocessor hardware applications and the systems.</td>
<td></td>
</tr>
</tbody>
</table>

The students should be able to

1. Be able to analyse and test vehicle electrical and electronic circuits.
2. Understand the operation of vehicle sensors, actuators and display units.
3. Understand the operation of microprocessor hardware and suppression methods used in vehicle circuits.
4. Be able to carry out systematic fault diagnosis and repairs on vehicle electronics systems.
UNIT I Analysis and test vehicle electrical and electronic circuits

Electrical calculations: voltage; emf; current; power; resistance; capacitance; inductance; series and parallel circuits
Semiconductor devices: electrical properties and characteristics of semiconductor material; P-N junction diode; Zener diode; N-P-N junction transistor; P-N-P junction transistor and thyristor; analyse the operation of a semiconductor based circuit, eg electronic ignition amplifier
Circuit diagrams: electrical and electronic component and circuit symbols; circuit diagram layouts

UNIT II Operation of vehicle sensors, actuators and display

Sensors: principles of operation and electrical characteristics of sensors used in vehicles eg sensors used in anti-lock braking systems (ABS), electronic fuel injection (EFI), engine management systems, airbags, security, driver information and vehicle condition monitoring systems); relevant test procedures for sensors
Actuators: principles of operation and electrical characteristics of vehicle actuators eg relays, solenoids, electro-hydraulic/pneumatic valves, rotary actuators, stepper motors; relevant tests procedures for actuators
Information display devices: types of devices eg analogue gauges, light emitting diodes, liquid crystal displays, vacuum fluorescent displays, cathode ray tubes; relevant test procedures for displays

UNIT III MCU control technology

Micro-computer hardware system components, addressing modes, storage, control and operation principle of bus architecture, interrupt system, interface principle, and assembly language programming methods . Require students to master computer information processing, control and storage methods, understanding of computer systems and components are working process.

UNIT IV Operation of microprocessor hardware and suppression methods

Microprocessor hardware: implementation, operation and relevant developments of microprocessor systems in vehicles eg computer area network (CAN) bus links; packaging; microcontrollers; integrated circuits; reliability; electromagnetic compatibility Suppression methods: resistive suppression of oscillations; screening; use of inductors; capacitors and filter networks in interference suppression

UNIT V Systematic fault diagnosis and repairs on vehicle electronic systems

Systematic testing: testing of input/output sensors, cables, supplies, earths, output actuators, display devices and microprocessor systems, correct use of multimeters and oscilloscope for measuring circuit and component values
Self-diagnosis: signal plausibility checks; open and short circuit checks; processor operation and memory test routines; error/trouble codes; standardization of connectors and codes; continuity checks; sensor output; resistance checks
Fault repairs: correct procedures for removal/refitting eg following manufacturer's recommendations; repair and replacement of system components

Text Books :
References
<table>
<thead>
<tr>
<th>MS2702</th>
<th>Aerodynamics of Racing Vehicles</th>
<th>3 Credits</th>
</tr>
</thead>
</table>

**Goal**
The understanding of the vehicle aerodynamics for the performance aspects.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the student to</td>
<td>Upon completion, the student should be able to</td>
</tr>
<tr>
<td>1. Overview of the vehicle aerodynamics.</td>
<td>1. Understanding of the aerodynamics.</td>
</tr>
<tr>
<td>2. Aerodynamics drag forces on the various racing vehicles.</td>
<td>2. Knowing the drag and the other forces.</td>
</tr>
<tr>
<td>3. Knowing the directional stability and the wind noise for race vehicles.</td>
<td>3. The concept of the stabilities is understood.</td>
</tr>
<tr>
<td>4. The understanding motorcycle aerodynamics and safety.</td>
<td>4. Exposure the motorcycle aerodynamics</td>
</tr>
<tr>
<td>5. The measurement and the testing techniques.</td>
<td>5. Understanding the safety aspects.</td>
</tr>
<tr>
<td>6. Knowledge of the testing techniques.</td>
<td>6. Knowledge of the testing techniques.</td>
</tr>
</tbody>
</table>
Unit-I Overview & Introduction

Aerodynamics and Race Cars, Scope, Historical developments and trends, Flow phenomena-External & Internal, Resistance to vehicle motion, Performance, Fuel consumption and economy

Unit II Aerodynamic drag of cars

Bluff body arrangement, Flow field around a car, Drag analysis, Drag fractions and their local origins, Strategies of body development

Unit-III Directional Stability, handling and wind noise

Introduction, Aerodynamic Forces and moments, Aerodynamics driver behavior, Influence of vehicle shape on aerodynamic forces and moments.

Wind noise-Mechanisms and generation, Design features, Measurement and Techniques

Unit-IV Safety and Motorcycle Aerodynamics

Flow field around a vehicle, Inlets and outlets, Forces on body work components, Water and dirt accumulation, Reducing splash and spray

Motor Cycle-Development, Riding dynamics, Methods of measurement tests, wind tunnel results

Unit-V Measurement and Test Techniques

Wind tunnel-Scope, Fundamental techniques, Simulation limitations, Proto type tests, Wind tunnel types and testing methods

Test techniques- scope, Measuring equipment and transducers, Road testing methods

Simulation –Demands, CFD methods for aerodynamics, Linear and nonlinear CFD models, Zonal methods.

Total: 45

Text Books


References

2. Joseph Katz, Race car aerodynamics, Bentley publishers, 1995
1. Introduction about the CFD tools and its applications
2. Simulation of channel flow.
4. Simulation of flow over an aerofoil.
5. Simulation of flow over an aerofoil for various drift angles.
7. Simulation of spoilers and diffuser.
8. Simulation of multi-phase flow.

Requirements
1. STARCCM+ software.
2. Gambit and fluent
3. CATIA or solid works

Total: 45
<table>
<thead>
<tr>
<th>MS4712</th>
<th>VEHICLE MAINTENANCE &amp; RECONDITIONING LABORATORY</th>
<th>1 Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>Provide maximum availability of safe and serviceable vehicles and maximum economic service life of vehicles.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the student to:</td>
<td>The students should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Understand the complete knowledge of the vehicle maintenance procedures and acquire skills in handling situations where the vehicle is likely to fail.</td>
<td>1. Describe the minor and major tuning of diesel and petrol engines</td>
<td></td>
</tr>
<tr>
<td>2. Understand various types of maintenance of vehicles and features and applications.</td>
<td>2. Dismantle, study, perform corrections and assemble the braking system, steering system and suspension system.</td>
<td></td>
</tr>
<tr>
<td>3. Objective of the preventive maintenance program is to minimize breakdowns, unscheduled repairs, and undue wear and tear.</td>
<td>3. Adjust the pedal play in clutch brake, hand brake and steering wheel.</td>
<td></td>
</tr>
<tr>
<td>4. To ensure maximum vehicle availability for customers with minimum interruptions due to unscheduled repairs and breakdowns.</td>
<td>4. Do the wheel alignment procedure and tyre removal procedure etc.</td>
<td></td>
</tr>
<tr>
<td>5. To Minimize the cost of fuel used by the fleet and provide safe, convenient fueling access for fleet customers.</td>
<td>5. define the procedures of valve grinding, lapping, reboring calibration of fuel injection pump etc.</td>
<td></td>
</tr>
</tbody>
</table>

*The Student must undergo a minimum of 15 days In-plant Training and must submit a report regarding the same. 50% of weightage is given in university practical examinations*
LIST OF EXPERIMENTS:

1. Study and layout of automobile repair shop.
2. Study and preparation of workshop statements.
3. Study and list of tools and instruments.
4. Minor and major tuning of diesel and petrol engines.
5. Fault diagnosis of ignition, starting and charging system.
6. Fault diagnosis of petrol and diesel fuel system and filters & air cleaners.
7. Fault diagnosis of lighting system horn & wiper.
8. Performing body repair works.
9. Adjustment of pedal play in clutch brake, hand brake and steering wheel.
10. Bleeding of hydraulic brake system and diesel fuel system and wheel bearing adjustment.
11. Removal of tyre & tube and adjustment of head lights.

RE-CONDITIONING LABORATORY

1. Cylinder reboring – checking the cylinder bore.
2. Valve grinding, valve lapping.
3. Setting the valve angle and checking for valve leakage
4. Calibration of fuel injection pump
5. Wheel alignment – testing of camber, caster.
7. Brake adjustment and bleeding.

Total: 45

L T P C 0 0

6 2

MS4713 Design Series I

This entails only a Viva-Voice and a Report on Virtual Design and Analysis of any type Racing Vehicle used in student’s competitions.
<table>
<thead>
<tr>
<th>AT2801</th>
<th>MODERN VEHICLE TECHNOLOGY</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>At the end of the course students will be able to know the recent trends in power plants, Noise and pollution control in automobiles, Vehicle operation and control and Vehicle automated tracks.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Objectives</strong></th>
<th><strong>Outcome</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the student to</td>
<td>The students should be able to</td>
</tr>
<tr>
<td>1 Understand the trends in power plants</td>
<td>1 Knows about the hybrid vehicles, battery vehicles and magnetic track vehicles.</td>
</tr>
<tr>
<td>2 Understand the Suspension brakes and safety.</td>
<td>2 Describe the working of stratified charged/lean burn engines and hydrogen engines and the working of air suspension and closed loop suspension system.</td>
</tr>
<tr>
<td>3 Conceive the significance of emission control methods.</td>
<td>3 Describe the working of antiskid braking system, regenerative braking safety cage and passenger comfort system and the internal and external pollution control through alternate fuels and power plants.</td>
</tr>
<tr>
<td>4 Understand the vehicle operation and control</td>
<td>4 Describe the working of catalytic converters and particulate filters, about noise pollution, measurement and control, the computer control for pollution and noise control for fuel economy and the working of transducers, actuators and information technology for receiving proper information and operation of the vehicle like optimum speed and direction.</td>
</tr>
<tr>
<td>5 Understand the vehicle automated tracks</td>
<td>5 Describe the preparation and maintenance of proper road network and national highway network with automated roads and vehicles and the working of vehicle operation for safe and fast travel by using satellite.</td>
</tr>
</tbody>
</table>
UNIT – I  TRENDS IN POWER PLANTS


UNIT – II  SUSPENSION BRAKES AND SAFETY

Air suspension – Closed loop suspension – antiskid braking system, Retarders, Regenerative braking safety cage – air bags – crash resistance – passenger comfort

UNIT – IIINOISE & POLLUTION

Reduction of noise – Internal & external pollution control through alternate fuels / power plants – Catalytic converters and filters for particulate emission.

UNIT – IVVEHICLE OPERATION AND CONTROL

Computer control for pollution and noise control and for fuel economy – Transducers and actuators – Information technology for receiving proper information and operation of the vehicle like optimum speed and direction.

UNIT – V  VEHICLE AUTOMATED TRACKS

Preparation and maintenance of proper road network – National highway network with automated roads and vehicles – Satellite control of vehicle operation for safe and fast travel.

Total: 45

Text Books


References


MS4811 Design Series II

*Students must design, fabricate and test a racing vehicle (in a track)/participate in the various student events conducted nationally/internationally.
# ELECTIVES FOR VII SEMESTER

<table>
<thead>
<tr>
<th>AT2703</th>
<th>AUTOMOTIVE INSTRUMENTATION AND EMBEDDED SYSTEMS</th>
<th>3 Credits</th>
</tr>
</thead>
</table>

**Goal**

To make the students to understand the instruments involved in measurement of various automotive parameters and a basic knowledge on embedded systems.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the student to</td>
<td>The students should be able to</td>
</tr>
<tr>
<td>1. Understand measurement characteristics.</td>
<td>1. Describe the classification of instrument and characteristics of instruments and the static and dynamic analysis, experimental error analysis, and statistical analysis.</td>
</tr>
<tr>
<td>2. Understand the working of automotive instruments.</td>
<td>2. Describe the working of modern automotive instrumentation and computerized instrumentation system.</td>
</tr>
<tr>
<td>3. Know about the measurement analysis.</td>
<td>3. Describe the measurements of fuel quantity, coolant temperature, oil pressure, vehicle speed and the working of display devices and information system and the operation of onboard and off board diagnostics, occupant protection system and warning system.</td>
</tr>
<tr>
<td>4. Understand the working of embedded systems.</td>
<td>4. Describe the working of gas analyzers, smoke tester, gas chromatography and spectrometry and the measurement of pH and review of basic measurement techniques.</td>
</tr>
<tr>
<td>5. Understand the working of real time operating system (RTOS)</td>
<td>5. Describe the working of serial communication using i2c, CAN, USB buses and parallel communication using ISA, PCI and the basics of basic concepts of RTOS, basics of real time and embedded system operating systems.</td>
</tr>
</tbody>
</table>
UNIT – I MEASUREMENT CHARACTERISTICS

Instrument Classification, Characteristics of Instruments – Static and dynamic, experimental error analysis, Systematic and random errors, Statistical analysis, Uncertainty, Experimental planning and selection of measuring instruments, Reliability of instruments.

UNIT – II AUTOMOTIVE INSTRUMENTATION

Modern automotive instrumentation – computerized instrumentation system, multiplexing, sampling and advantages – Measurements – fuel quality, coolant temperature, oil pressure vehicles speed, Display devices – LED, LCD, VFD, CRT and types, CAN network, the glass cockpit and information system.

Onboard diagnostics – fault code displays. Off board diagnostics – engine data display, expert system occupant protection system – Airbag deployment system security and warning systems.

UNIT – IIIMEASUREMENT ANALYSIS

Chemical, thermal, magnetic and optical gas analyzers, measurement of smoke, dust and moisture, gas chromatography, spectrometry, measurement of pH, Review of basic measurement techniques.

UNIT – IV INTRODUCTION TO EMBEDDED SYSTEM


UNIT - V: REAL TIME OPERATING SYSTEM (RTOS)

Introduction to basic concepts of RTOS, Basics of real time & embedded system operating systems, RTOS – Interrupt handling, task scheduling; embedded system design issues in system development process – Action plan, use of target system, emulator, use of software tools.

TOTAL: 45

TEXT BOOKS


REFERENCES

<table>
<thead>
<tr>
<th>MS4721</th>
<th>Business Management for Engineers</th>
<th>3 Credits</th>
</tr>
</thead>
</table>

**Goal**

To expose the students in managerial functions like planning, organizing, staffing, leading and controlling.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the students to:</td>
<td>The students should be able to:</td>
</tr>
<tr>
<td>1. Gain Knowledge on the principles of management is essential at all levels in all types of organizations.</td>
<td>1. Understand the organization structure of the industry;</td>
</tr>
<tr>
<td>2. Have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling.</td>
<td>2. Understand the need of Planning;</td>
</tr>
<tr>
<td>3. Students will also gain some basic knowledge on the various functional specialization of management.</td>
<td>3. Understand the function of production planning and control, PERT/CPM, Quality Control</td>
</tr>
<tr>
<td></td>
<td>4. Do Project Appraisal Analysis</td>
</tr>
<tr>
<td></td>
<td>5. Understand the Human resource and marketing management.</td>
</tr>
</tbody>
</table>
UNIT I HISTORICAL DEVELOPMENT

UNIT II PLANNING

UNIT III ORGANISING

UNIT IV DIRECTING

UNIT V CONTROLLING

TOTAL: 45

TEXT BOOKS

REFERENCES
<table>
<thead>
<tr>
<th>MS4722</th>
<th>DESIGN FOR MANUFACTURE AND ASSEMBLY</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To learn the design concepts of a product/component considering the manufacturability, ease of assembly and environmental safety into account.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Objectives</strong></th>
<th><strong>Outcome</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the student to</td>
<td>The students should be able to</td>
</tr>
<tr>
<td>1. Introduce design principles, properties of materials, fits and tolerances and datum features.</td>
<td>1. Select the design principle, suitable material, mechanism, fit and tolerance for designing a product/component.</td>
</tr>
<tr>
<td>2. Understand the influence of materials on form design and able to select possible material and feasible design.</td>
<td>2. Select the appropriate material, proper working principle and a feasible design.</td>
</tr>
<tr>
<td>3. Introduce design features to facilitate machining and design for mach inability, economy, accessibility and assembly.</td>
<td>3. Design (optimum) a component which requires less material removal, easy to machine, assemble, access and cost effective.</td>
</tr>
<tr>
<td>4. Know about redesign of castings, modifying the uneconomical design, group technology and applications of DFMA.</td>
<td>4. Redesign the uneconomical casting design and know the applications of DFMA.</td>
</tr>
<tr>
<td>5. Understand the Environmental objectives and issues and to design considering them.</td>
<td>5. Incorporate the Environmental Objectives, issues and guidelines into the design.</td>
</tr>
</tbody>
</table>
UNIT I INTRODUCTION
General design principles for manufacturability - strength and mechanical factors, mechanisms selection, evaluation method, Process capability - Feature tolerances - Geometric tolerances Assembly limits -Datum features - Tolerance stacks.

UNIT II FACTORS INFLUENCING FORM DESIGN
Working principle, Material, Manufacture, Design- Possible solutions -Materials choice – Influence of materials on form design - form design of welded members, forgings and castings.

UNIT III COMPONENT DESIGN - MACHINING CONSIDERATION

UNIT IV COMPONENT DESIGN – CASTING CONSIDERATION
Redesign of castings based on Parting line considerations - Minimizing core requirements, machined holes, redesign of cast members to obviate cores. Identification of uneconomical design - Modifying the design - group technology - Computer Applications for DFMA

UNIT V DESIGN FOR THE ENVIRONMENT

Total 45

TEXT BOOKS


REFERENCES

<table>
<thead>
<tr>
<th>MS4724</th>
<th>VEHICLE DESIGN AND DATA CHARACTERISTICS</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>The vehicle dynamics is the aspect that is to be controlled to get the maximum output.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td>The course should enable the student to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. The different aspects of the vehicle dynamics.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. The understanding of the longitudinal dynamics controls systems.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. The understanding of the steering control system</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. The electronic stability understanding and controls.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Knowledge of the aspect of the passive and semi-active suspension to have better controls.</td>
<td></td>
</tr>
<tr>
<td><strong>Outcome</strong></td>
<td>Upon completion, the student should be able to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Understanding of the dynamics of vehicle.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Understanding the different aspects of the vehicle dynamics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Knowing the steering control system.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Exposure to the electronic stability program and the control.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. The semi-active and the passive system for the future.</td>
<td></td>
</tr>
</tbody>
</table>
OBJECTIVE

Students have to collect important technical specifications of an automobile from Automobile Journals and keeping this, as a guide, they have to calculate and tabulate various vehicle performance parameters and design parameters and to draw curves using these data.

UNIT I INTRODUCTION

Assumptions to be made in designing a vehicle Range of values for Gross Vehicle Weight, Frontal Area, maximum speed, maximum acceleration, gradability in different gears, Basics of Automobile Design.

UNIT II RESISTANCE TO VEHICLE MOTION

Calculation, Tabulation and Plotting of Curves for Air and Rolling Resistances at various vehicle speeds, Calculation and Plotting of Driving force, Power requirement for different loads and acceleration, Maximum Power calculation.

UNIT III PERFORMANCE CURVES

Calculation, Tabulation and Plotting of Torque and Mechanical Efficiency for different vehicle speeds, Interpolation of Pressure – Volume diagram, Calculation of frictional Mean Effective Pressure, Calculation of Engine Cubic Capacity, Bore and Stroke Length.

UNIT IV POWER GENERATION

Connecting rod length to Crank Radius Ratio, Plotting of Piston Velocity and Acceleration against Crank Angle, Plotting Gas force, inertia force and Resultant force against Crank Angle, Turning Moment and Side Thrust against Crank Angle.

UNIT V GEAR RATIOS

Determination of Gear Ratios, Acceleration and Gradability, Typical Problems on Vehicle performance.

TOTAL: 45

TEXT BOOKS


REFERENCE

1. R.B. Gupta, Automobile Engineering.
<table>
<thead>
<tr>
<th>MS4724</th>
<th>VEHICLE DYNAMICS AND CONTROL</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>The vehicle dynamics is the aspect that is to be controlled to get the maximum output.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the student to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The different aspects of the vehicle dynamics.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. The understanding of the longitudinal dynamics controls systems.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. The understanding of the steering control system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. The electronic stability understanding and controls.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Knowledge of the aspect of the passive and semi-active suspension to have better controls.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upon completion, the student should be able to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Understanding of the dynamics of vehicle.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Understanding the different aspects of the vehicle dynamics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Knowing the steering control system.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Exposure to the electronic stability program and the control.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. The semi-active and the passive system for the future.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Unit-ILateral Vehicle Dynamics and Control

Kinematic models, Bicycle model, Dynamic model in terms of - Error with respective to road, yaw rate and slip angle

State Feedback, Steady State Analysis: Understanding Steady State Cornering, Output Feedback Problem

Unit -III Longitudinal Vehicle Dynamics and Control

Longitudinal Vehicle Model –Aero dynamic drag, Longitudinal tire force & slip, Rolling resistance, Calculation of Normal Tire force and effective tire radius, Driveline Dynamics- Transmission dynamics, Engine dynamics, wheel dynamics

ABS systems- Motivations, Functions, and Deceleration threshold based algorithms

Unit-III Steering Control

State Feedback, Steady state error from Dynamic equations, Steady state cornering-Steering angle, Yaw angle, Longitudinal velocity, Output feedback, Unity feedback Loop system, Loop analysis, Closed loop analysis

Unit IV Electronic Stability Control

Introduction- Functioning of stability control system and systems, Differential Braking system- Vehicle model, Control architecture, Desire yaw rate & slip rate, Upper bounded values of target yaw rate & slip angle, Upper and lower controller

Independent All-wheel drive Torque Distribution design –Traditional four wheel drive systems.

Unit –V Passive & Semi active suspensions and its Control

Introduction to Automotive suspensions-Full, half and quarter car models, Modal decoupling, Performance variables for a ¼ car model, Natural frequencies and mode shapes, Approximate Transfer Functions using Decoupling Vibration, Analysis in the sprung mass and unsprung mass mode, Verification of the influence of suspension k, c and Tire stiffness.

SAS model, Optimum SAS- formulation, definition, solution, control law, Calculation of Transfer function plots, Performance of SAS-Weighted ride quality, Skyhook damping

Text Book:

1. Rajesh Rajamani, Vehicle Dynamics and Control, Springer 2005
3. Ashish Tewari, —Modern Control Design with Matlab& Simulinkl, John Wiley, New Delhi 2002

References

3. Millikan& Millikan, — Race Car vehicle Dynamicsl, SAE
<table>
<thead>
<tr>
<th>AT2702</th>
<th>VEHICLE MAINTENANCE</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Provide maximum availability of safe and serviceable vehicles and maximum economic service life of vehicles.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>The subject should enable the student to</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The students should be able to</td>
<td></td>
</tr>
</tbody>
</table>

1. Understand the complete knowledge of the vehicle maintenance procedures and acquire skills in handling situations where the vehicle is likely to fail.<br>2. Understand various types of maintenance of vehicles and features and applications.<br>3. Objective of the preventive maintenance program is to minimize breakdowns, unscheduled repairs, and undue wear and tear.<br>4. To ensure maximum vehicle availability for customers with minimum interruptions due to unscheduled repairs and breakdowns.<br>5. To Minimize the consumption of petroleum based fuels and assure fuel security and accountability;<br>6. To Minimize the cost of fuel used by the fleet and provide safe, convenient fueling access for fleet customers. |

1. Differentiate various layouts, analyze the merits and limitations and apply in real time.<br>2. Dismantle study, perform corrections and assemble the various parts of the vehicle.<br>3. Describe the maintenance procedures of various systems like steering systems, braking system, suspension system and engine etc.<br>4. Dismantle study, rectify and assemble drive line system, final drive and differential, rear axle, wheels and tires, suspension and brake systems.<br>5. Realize effects of maintenance and minimize the consumption of petroleum based fuels.<br>6. Be familiar with maintenance procedures of engine, cooling system and lubrication system, checking and servicing of dash board instruments, wheel alignment, computerized alignment and wheel balancing, and door locks and window glass actuating system maintenance.
UNIT - I: MAINTENANCE OF RECORDS AND SCHEDULES

Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists. Inspection schedule, Maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNIT - II: ENGINE MAINTENANCE – REPAIR AND OVERHAULING

Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNIT - III: CHASSIS MAINTENANCE - REPAIR AND OVERHAULING

Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system. Maintenance servicing of suspension systems. Brake systems, types and servicing techniques. Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.

UNIT - IV: ELECTRICAL SYSTEM MAINTENANCE – SERVICING AND REPAIRS

Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems. Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNIT V: MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VEHICLE BODY

Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply. Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives. Lubrication maintenance, lubricating oil changing, greasing of parts. Vehicle body maintenance, Minor and major repairs. Door locks and window glass actuating system maintenance.

Total: 45

Text Book


References

## ELECTRICAL ENGINE MANAGEMENT SYSTEM

**AT2853**  
**3 Credits**

### Goal
This module enables the students to interface sensors in modern automotive electronic systems. The students will be taught automotive sensors, characterization, sensor selection, interfacing, sensing, data logging and data processing for specified applications.

### Objectives
The course should enable the student to:

1. Understand the automotive instruments and sensors.
2. Understand the measurement of engine parameter by using sensor.
3. Understand the working Electronic Ignition System.
4. Understand the Principles of Digital Control systems and the application of on board diagnosis.
5. Understand the concept of Engine Mapping

### Outcome
The students should be able to:

1. Describe the sensor classification and sensor product selection guide.
2. Describe the measurements of automotive sensors and the working of Pressure, position, flow, temperature, humidity, speed, acceleration, oxygen, torque, light, distance and level.
3. Describe the electronic fuel injection system in SI and CI engines and the advantages of using direct fuel injection over the indirect fuel injection system.
4. Describe the advantages of electronic ignition system over the conventional ignition system and the algorithms for digital controllers.
5. Describe the digital control techniques.
UNIT – I SENSORS

Types – Air flow, Pressure, Temperature, Speed Oxygen, Detonation, Position – Principle of operation, Arrangement and material.

UNIT – II GASOLINE INJECTION SYSTEM

Open loop and closed loop systems, Mono point, Multi point and Direct injection systems – Principles and Features, Bosch injection systems.

UNIT – IIDIESEL INJECTION SYSTEM

Inline injection pump, Rotary pump and injector – Construction and principle of operation, Common rail and unit injector system – Construction and principle of operation.

UNIT – IVIGNITION SYSTEMS

Ignition fundamentals, Types of solid state ignition systems, High energy ignition distributors, Electronic spark timing and control.

UNIT – V ENGINE MAPPING

Combined ignition and fuel management systems. Digital control techniques – Dwell angle calculation, Ignition timing calculation and Injection duration calculation. Hybrid vehicles and fuel cells.

Total: 45

Text Books


References

<table>
<thead>
<tr>
<th>AT2854</th>
<th>VIBRATION AND NOISE CONTROL</th>
<th>3 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goals</td>
<td>The students will be able to understand the sources of vibration and noise in automobiles and make design modifications to reduce the vibration and noise and improve the life of the components.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
</table>
| The course should enable the students to:  
1. Understand the various types of vibration with damping and without damping. | The students should be able to know  
1. Classification of vibration of free, forced, undamped, damped, linear, non linear vibration. Response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems, torsional vibration, Determination of natural frequencies. |
| 2. Understand the Various types of noise and it's measurement and analysis techniques. | 2. Introduction to amplitude, frequency, wavelength and sound pressure level, Addition, subtraction and averaging decibel levels, Noise dose level, legislation, measurement and analysis of noise, Measurement environment, equipment, frequency analysis, tracking analysis, sound quality analysis. |
| 4. Understand the various noise controlling techniques. | 4. Vibration isolation by tuned absorbers, untuned viscous dampers. Damping treatments, application dynamic forces generated by IC engines, engine isolation, Crank shaft damping, Modal analysis of the mass elastic model shock absorbers. |
| 5. Understand the various noise from mechanical components and it's suppressing techniques. mechanical noise, predictive analysis. | 5. Methods for control of engine noise, combustion noise, Suppressing Techniques like palliative treatments and enclosures, automotive noise control principles. Sound in enclosures, sound energy absorption, sound transmission through barrier |

144
UNIT I BASICS OF VIBRATION
Introduction, classification of vibration: free and forced vibration, undamped and damped vibration, linear and non-linear vibration, response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems, torsional vibration, determination of natural frequencies.

UNIT II BASICS OF NOISE
Introduction, amplitude, frequency, wavelength and sound pressure level, addition, subtraction and averaging decibel levels, noise dose level, legislation, measurement and analysis of noise, measurement environment, equipment, frequency analysis, tracking analysis, sound quality analysis.

UNIT III AUTOMOTIVE NOISE SOURCES

UNIT IV CONTROL TECHNIQUES
Vibration isolation, tuned absorbers, untuned viscous dampers, damping treatments, application dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.

UNIT V SOURCE OF NOISE AND CONTROL
Methods for control of engine noise, combustion noise, mechanical noise, predictive analysis, palliative treatments and enclosures, automotive noise control principles, sound in enclosures, sound energy absorption, sound transmission through barriers

TOTAL: 45

TEXT BOOKS

REFERENCES
### AT2856

**AUTOMOTIVE SENSORS AND APPLICATIONS**

| Goal | The module enables the students to interface sensors in modern automotive electronic systems. The students will be taught automotive sensors, characterization, sensor selection, interfacing, sensing, data logging and data processing for specified applications. |

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the students to:</td>
<td>The students should be able to:</td>
</tr>
<tr>
<td>2. Understand the automotive instruments and sensors.</td>
<td>1. Describe the sensor classification and sensor product selection guide and the measurements of automotive sensors.</td>
</tr>
<tr>
<td>3. Understand the measurement of engine parameter by using sensor.</td>
<td>2. Describe the working of Pressure, position, flow, temperature, humidity, speed, acceleration, oxygen, torque, light, distance and level, the principles of actuation control, the working of stepper and DC motor, working of relays and solenoids and the working of adaptive cruise control, traction control, braking control, steering and stability by using sensors.</td>
</tr>
<tr>
<td>4. Understand the working of actuators.</td>
<td>3. Describe the intelligent transport system using sensors, working of the Lighting, wipers, climate control and electronic displays using sensors.</td>
</tr>
<tr>
<td>5. Understand the working of chassis for sensors.</td>
<td>4. Describe the Sensors role in occupant safety.</td>
</tr>
<tr>
<td>6. Understand the application of intelligent sensors.</td>
<td>5. Describe the working of digital vehicle and intelligent vehicle system.</td>
</tr>
</tbody>
</table>
UNIT I: INTRODUCTION


UNIT II: SENSORS FOR ENGINES

Sensors and interfacing - Pressure, position, flow, temperature, humidity, speed, acceleration, oxygen, torque, light, distance and level.

UNIT III: ACTUATORS

Principles of actuation and control. DC motors, stepper motors. Relays and solenoids. Hydraulic and pneumatic.

UNIT IV: SENSORS FOR CHASSIS

Sensors and interfacing techniques for Engine control, adaptive cruise control, braking control, traction control, steering and stability.

UNIT V: INTELLIGENT SENSORS

Sensors for intelligent transport systems. Lighting, wipers, climate control and electronic displays. Sensors for occupant safety. The digital vehicle. Intelligent vehicle systems

Text Books

Total: 45
# AT2857: FUEL CELLS AND APPLICATIONS

<table>
<thead>
<tr>
<th>Goal</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>To impart knowledge about the concept &amp; working of the Fuel Cells, its construction, types and its application in automobiles, impact on its performance.</td>
<td></td>
</tr>
</tbody>
</table>

## Objectives

<table>
<thead>
<tr>
<th>The course should enable the students to:</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Understand various types of Fuel Cells, its principle, construction &amp; working.</td>
<td>The students should be able to</td>
</tr>
<tr>
<td>2. Understand the automotive applications of Fuel Cells, improvements &amp; advances &amp; commonly used types.</td>
<td>1. Analyze the thermodynamics &amp; electrochemical kinetics of fuel cells.</td>
</tr>
<tr>
<td>3. Know about the various components &amp; its performance characteristics in a fuel cell vehicle.</td>
<td>2. Be familiar with the automotive applications of Fuel Cells.</td>
</tr>
<tr>
<td>4. Gain knowledge about the different types of fuels used in Fuel Cells and the concept of Fueling.</td>
<td>3. Update himself to the current advances in Fuel Cell Vehicle Technologies.</td>
</tr>
<tr>
<td>5. Do an analysis &amp; comparative study of fuel cells with other types of alternate fuels, the types &amp; working of different types of Fuel Cells and the performance characteristics of the Fuel cells.</td>
<td>4. Be familiar with the various components of the fuel cells</td>
</tr>
<tr>
<td></td>
<td>5. Be familiar with the various types of Fueling techniques followed in the Fuel cells, Do a comparative study of the Fuel cells with other Alternate Fuels.</td>
</tr>
</tbody>
</table>
UNIT – I: INTRODUCTION TO FUEL CELLS

Introduction – working and types of fuel cell – low, medium and high temperature fuel cell, Liquid and methanol types, Proton exchange membrane fuel cell solid oxide, Hydrogen fuel cells – Thermodynamics and electrochemical kinetics of fuel cells.

UNIT – II: FUEL CELLS FOR AUTOMOTIVE APPLICATIONS

Fuel cells for automotive applications – Technology advances in fuel cell vehicle systems – Onboard hydrogen storage – Liquid hydrogen and compressed hydrogen – Metal hydrides, Fuel cell control system – Alkaline fuel cell – Road map to market.

UNIT – III: FUEL CELL COMPONENTS AND THEIR IMPACT ON PERFORMANCE

Fuel cell performance characteristics – Current/voltage, Voltage efficiency and power density, ohmic resistance, Kinetic performance, Mass transfer effects – Membrane electrode assembly components, Fuel cell stack, Bi-polar plate, Humidifiers and cooling plates.

UNIT – IV: FUELING


UNIT – V: FUEL CYCLE ANALYSIS

Introduction to fuel cycle analysis – Application to fuel cell and other competing technologies like battery powered vehicles, SI engine fuelled by natural gas and hydrogen and hybrid electric vehicle.

TOTAL: 45

TEXTBOOKS

### Goal

Technological change and Automation are unavoidable in Industry. This subject enables the student to understand about Robotics, its application, components.

### Objectives

The course should enable the students to:

1. Understand Automation and Robotics with preserve and future application.
2. Study the various components, constructional aspects of Industrial Robotics.
3. Understand various motions and coordinations.
4. Understand the activating system and components and sensor of a Robot.
5. Understand the application of robots in manufacturing relating to automobile industry.

### Outcome

The students should be able to

1. Select tools for required application.
2. Configure robots with components and devices.
4. Able to make automation modules based on sensor input.
5. Able to design and fabricate small robots for material handling, spray painting, spot welding, assembly, inspection etc.,
UNIT–I Introduction: 9
Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications – classification by coordinate system and control system.

UNIT – II Components of the Industrial Robotics: 9
Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

UNIT – III Motion Analysis: 9

UNIT – IV Robot actuators and Feedback components: 9

UNIT VRobot Application in Manufacturing: 9
Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

Total: 45

Text Books
1. Industrial Robotics / Groover M P /Pearson Edu.
2. Robotics and Control / Mittal R K &Nagrath I J / TMH.

References
4. Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter-Science.
5. Introduction to Robotics / John J Craig / Pearson Edu.
### AT2859  
**ALTERNATIVE FUELS AND ENERGY SYSTEMS**

**3 Credits**

#### Goal
To provide the students with the knowledge of alternate fuels and the changes in the engine design and to understand various energy systems for use in the automobiles.

#### OBJECTIVES

The course should enable the student to:

1. Gain knowledge of various alternate fuels.
2. Understand properties, performance and emission characteristics of Alcohols.
4. Study in depth of various vegetable oils used for engines.
5. Know about Electric vehicle.

#### OUTCOME

Upon completion, the student should be able to:

1. Apply various alternate fuels appropriately to the needs.
2. Learn in details about methanol and ethanol usage, storage, chemical structure, pros and cons.
3. Be acquainted with the knowledge of natural gas, LPG, hydrogen and biogas.
4. Evaluate the performance characteristics of various vegetable oils.
5. Be familiar with electric and hybrid vehicles.
UNIT - I: INTRODUCTION

Need for alternate fuel, Availability and properties of alternate fuels, general use of alcohols, LPG, Hydrogen, Ammonia, CNG and LNG, Vegetable oils and biogas, Merits and demerits of various alternate fuels, Introduction to alternate energy sources. Like EV, Hybrid, Fuel cell and solar cars.

UNIT - II: ALCOHOLS

Properties as engine fuel, Alcohols and gasoline blends, Performance in SI engine, Methanol and gasoline blends, Combustion characteristics in CI engines, Emission characteristics, DME, DEE properties performance analysis, Performance in SI & CI Engines.

UNIT - III: NATURAL GAS, LPG, HYDROGEN AND BIOGAS

Availability of CNG, properties, Modification required using in engines, Performance and emission characteristics of CNG using LPG in SI & CI engines, Performance and emission of LPG. Hydrogen; Storage and handling, Performance and safety aspects.

UNIT - IV: VEGETABLE OILS

Various vegetable oils for engines, Esterification, Performance in engines, Performance and emission characteristics, Bio diesel and its characteristics

UNIT - V: ELECTRIC, HYBRID, FUEL CELL AND SOLAR CARS

Layout of an electric vehicle, Advantage and limitations, Specifications, System components, Electronic control system, High energy and power density batteries, Hybrid vehicle, Fuel cell vehicles, Solar powered vehicles.

Total: 45

Text Book

References
4. SAE paper nos. 840367, 841333, 841334, 841156, Transactions, SAE, USA.