UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE

(2013 SCHEME)

SYLLABUS FOR

III SEMESTER
MECHANICAL - STREAM - AUTOMOBILE ENGINEERING
### SCHEME -2013

#### III SEMESTER

**MECHANICAL - STREAM - AUTOMOBILE ENGINEERING (U)**

<table>
<thead>
<tr>
<th>Course No</th>
<th>Name of subject</th>
<th>Credits</th>
<th>Weekly load, hours</th>
<th>C A Marks</th>
<th>Exam Duration Hrs</th>
<th>U E Max Mark s</th>
<th>Total Marks</th>
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</thead>
<tbody>
<tr>
<td>13.301</td>
<td>Engineering Mathematics-II (ABCEFHMNPRSTU)</td>
<td>4</td>
<td>L:3 T:1 D/P:1</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>150</td>
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<tr>
<td>13.302</td>
<td>Humanities (BEFMRSU)</td>
<td>3</td>
<td>L:3 T:1 D/P:1</td>
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<td>3</td>
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<td>150</td>
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<tr>
<td>13.303</td>
<td>Auto Chassis (U)</td>
<td>5</td>
<td>L:3 T:1 D/P:1</td>
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<td>3</td>
<td>100</td>
<td>150</td>
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<tr>
<td>13.304</td>
<td>Mechanics of Solids (MNPSU)</td>
<td>4</td>
<td>L:3 T:1 D/P:1</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>150</td>
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<tr>
<td>13.305</td>
<td>Auto Chassis Lab (U)</td>
<td>2</td>
<td>L:1 T:1 D/P:2</td>
<td>50</td>
<td>3</td>
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<tr>
<td>13.306</td>
<td>Machines and Auto Component Drawing (U)</td>
<td>5</td>
<td>L:1 T:1 D/P:4</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>150</td>
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<tr>
<td>13.307</td>
<td>Thermal Engineering(MU)</td>
<td>4</td>
<td>L:3 T:1 D/P:1</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>150</td>
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<tr>
<td>13.308</td>
<td>Heat Engines Lab (U)</td>
<td>2</td>
<td>L:1 T:1 D/P:2</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>150</td>
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<td><strong>Total</strong></td>
<td></td>
<td>29</td>
<td>L:16 T:4 D:9</td>
<td>400</td>
<td>800</td>
<td>1200</td>
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Course Objective:

This course provides students a basic understanding of vector calculus, Fourier series and Fourier transforms which are very useful in many engineering fields. Partial differential equations and its applications are also introduced as a part of this course.

Module – I


Module – II


Fourier Transforms: Fourier integral theorem (no proof) –Complex form of Fourier integrals-Fourier integral representation of a function- Fourier transforms – Fourier sine and cosine transforms, inverse Fourier transforms, properties.

Module – III


Module – IV

Applications of Partial differential equations: Solution by separation of variables. One dimensional Wave and Heat equations (Derivation and solutions by separation of variables). Steady state condition in one dimensional heat equation. Boundary Value problems in one dimensional Wave and Heat Equations.

References:


**Internal Continuous Assessment (Maximum Marks-50)**

- 50% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.
- 20% - Regularity in the class

**University Examination Pattern:**

- Examination duration: 3 hours
- Maximum Total Marks: 100

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course Outcome:**

At the end of the course, the students will have the basic concepts of vector analysis, Fourier series, Fourier transforms and Partial differential equations which they can use later to solve problems related to engineering fields.
Teaching Scheme: 3(L) - 0(T) - 0(P)  
Credits: 3

Course Objectives:

- **To explore the way in which economic forces operate in the Indian Economy.**
- **The subject will cover analysis of sectors, dimensions of growth, investment, inflation and the role of government will also be examined.**
- **The principle aim of this subject is to provide students with some basic techniques of economic analysis to understand the economic processes with particular reference to India.**
- **To give basic concepts of book keeping and accounting**

**PART I  ECONOMICS** (2 periods per week)

**Module – I**

Definition of Economics – Central Economic Problems – Choice of techniques – Production possibility curve – Opportunity Cost-Micro & Macro Economics


Production function – Law of Variable proportion – Returns to scale – Iso-quants and Isocost line- Least cost combination of inputs – Cost concepts – Private cost and Social Cost -

Short run and Long run cost- cost curves – Revenue – Marginal, Average and Total Revenue-Break even Analysis

**Module – II**


**PART-II- ACCOUNTANCY** (1 Period per week)

**Module – III**


Final accounts: Preparation of trading and profit and loss Account- Balance sheet (with simple problems) - Introduction to accounting packages (Description only).

**References**


**Internal Continuous Assessment (Maximum Marks-50)**

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

**University Examination Pattern:**

*Examination duration: 3 hours*  
*Maximum Total Marks: 100*

*The question paper shall consist of 2 parts. Part I and Part II to be answered in separate answer books.*
Part I Economics (70 marks) – Part I shall consist of 2 parts.

Part A (20 Marks) - Two short answer questions of 10 marks each, covering entire syllabus. All questions are compulsory. (10x2=20marks)

Part B (50 marks) - Candidates have to answer one full question out of the two from Part I (Module I and Module II). Each question carries 25 marks.

Part II Accountancy (30 marks)

Candidates have to answer two full questions out of the three from Part II (Module III). Each question carries 15 marks.

Course outcome:

• The students will be acquainted with its basic concepts, terminology, principles and assumptions of Economics.

• It will help students for optimum or best use of resources of the country

• It helps students to use the understanding of Economics of daily life

• The students will get acquainted with the basics of book keeping and accounting
13.303 AUTO CHASSIS (U)

Teaching Scheme: 3(L) - 1(T) - 1(P)  
Credits: 5

Course Objectives:

To introduce the basics, working principle and construction of all the Automobile Chassis Components.

Module – I

Introduction: Profile of Automobile Industry, Types of automobiles, general considerations relating to chassis layout and power plant Location, relative merits & demerits of different layouts, description of different types of chassis layout.

Frames and body: Role and requirement of a chassis frame. loads acting on frames Types of chassis – Light, medium and heavy duty vehicle chassis, ladder chassis, Types of Frames (conventional, integral construction and perimeter frame) materials, cross members and X members, frame sections, defects in frames, frame repairs, frame alignment. integral body. Design features of a body – Types of bodies, coach built, convertibles. Body accessories, bumpers.

Module – II

Front axle and steering system: Front axle construction, stub axles, dead axle & live axle, front wheel assembly, steering geometry / wheel alignment - castor, camber, kingpin inclination, toe-in, toe-out, Condition for true rolling, effects of wheel misalignments, Ackerman & Davis steering gear, different types of steering gears and their construction, conventional layout of steering linkage. Power and power assisted steering, under steering and over steering effects, four wheel steering, steering of crawler tractors

Suspension: Objectives, types of springs, spring materials, leaf spring, coil spring, torsion bar, rubber & pneumatic suspension, Hydro-elastic suspension, shock absorbers, types of independent suspension.

Module – III

Drive line: Torque reaction, driving thrust, Hotchkiss drive, torque tube drive, propeller shaft, universal joints, types, differential action, constructional details, differential lock, limited slip differential, axle housing types & construction, double reduction and twin speed final drives, multi axle vehicles

Wheels and tyres: Types of wheel, construction of wired wheel, disc wheel, tyre type & construction, aspect ratio, specification of tyres, tyre rotation, static & rolling properties of pneumatic tyres.
Module – IV

**Brakes:** Types, stopping times & distance, braking efficiency, brake drums and liners, theory of shoe brakes, determination of brake torque, self energizing brakes, determination of brake torque, disc brakes, classification of brakes, Hydraulic brakes, mechanical brakes, servo brakes, power assisted brakes, air brakes, fail safe brakes, exhaust brakes, retarders, layout & details of components. Fundamentals of Antilock Braking System (ABS).

**References:**


**Internal Continuous Assessment (Maximum Marks-50)**

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

**University Examination Pattern:**

*Examination duration: 3 hours Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

- **Part A (20 marks)** - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

- **Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course Outcome:**

At the end of the course, the students will be familiar with the fundamentals of *Automobile Chassis Components.*
13.304 MECHANICS OF SOLIDS (MNPSU)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objectives:

- To acquaint with the basic concepts of stress and deformation in solids.
- To practise the methodologies to analyse stresses and strains in simple structural members and to apply the results in simple design problems.

Module – I

Concept of stress – normal stress and shear stress, concept of strain, normal strain and shear strain, constitutive relation, Hooke’s law, modulus of elasticity, modulus of rigidity, deformation of axially loaded bars, members with varying cross section, principle of superposition, composite bars, thermal stress. Saint-Venant’s Principle and stress concentration.

Module – II

Linear strain and lateral strain, Poisson’s ratio, volumetric strain, bulk modulus of elasticity, relationship between elastic constants.

Concept of stress and strain tensor, generalised Hooke’s law. Definition of plane stress, plane strain and examples. Stress transformation (2D only) principal stress and Mohr’s circle, Strain energy due to axial loads- gradually and suddenly applied impact loads.

Module – III


Module – IV

References:


Internal Continuous Assessment (Maximum Marks-50)

- 50% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
- 20% - Regularity in the class

University Examination Pattern:

- Examination duration: 3 hours
- Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

*Student would be able to analyse stresses and strains in simple structural members and to apply the results in simple design problems. This subject will lay foundation to study subjects like mechanics of materials, machine design etc.*
13.305 AUTO CHASSIS LAB (U)

Teaching Scheme: 0(L) - 0(T) - 2(P)  
Credits: 2

Course Objectives:

- **To provide knowledge about Automotive Engine and Chassis components**
- **Make to students to familiar with Disassembling and assembling of various systems in automobiles.**
- **Identify the various components and familiar with repair of the components.**

List of Experiments:

1. Study of hand tools and equipments sketching and its uses. Study of different types of chassis layouts, components and measuring the chassis dimensions.
2. Disassembling of 4 cylinder engine, inspection of components, servicing of components, decarbonising procedure, measurement of dimension of different components of engine, compare with standard specifications, piston ring testing, assembling using special tools.
3. Disassembling cylinder head, servicing of valves, adjusting tappet clearance, testing valve spring tension with spring tester
4. Valve timing & adjustments of fan belt tension.
5. Compression test of petrol and diesel engine.
6. Rectifying the troubles in ignition system, adjusting spark plug and CB Point gap, checking ignition timing.
7. Servicing of Fuel supply system in Petrol engines - Servicing of A.C. Mechanical fuel pump and testing the pump. Servicing of carburetor, carburetor adjustments, tuning of carburetors.
8. Servicing of fuel injection pump, injector, testing of injector
9. Servicing of clutch assembly, checking the spring tension of coil springs in spring tester.
10. Dismantling of gear box, inspecting Components, servicing, checking the gear ratios. Study of Transaxle assembly.
12. Servicing of steering gear box, checking for end play.
13. Servicing master and wheel cylinders in hydraulic brake system, bleeding of brakes.
15. Preparing immature models of body structures of cars, jeeps, van and heavy duty vehicles. (By adopting suitable scales prepared by sheet metal work)

**Note:** Students should complete at least 11 experiments from the above during the semester

**Internal Continuous Assessment** *(Maximum Marks-50)*

- 20% - Test/s
- 60% - Class work and Fair Record
- 20% - Regularity in the class

**University Examination Pattern:**

*Examination duration: 3 hours  Maximum Total Marks: 100*

Questions based on the list of experiments prescribed.

- 80% - Procedure, conducting experiment, results, tabulation and inference
- 20% - Viva voce

Candidate shall submit the certified fair record for endorsement by the external examiner.

**Course Outcome:**

At the end of the course, the students will be familiar with the fundamentals and working principle of various Automobile Chassis Components.
13.306 MACHINES AND AUTO COMPONENT DRAWING (U)

Teaching Scheme: 1(L) - 0(T) - 4(P)  
Credits: 5

Course Objectives:

To enable the engineering students to understand
- Indian codes and standards for engineering drawing
- Representation of Fits and Tolerances in technical drawing
- Draw a detailed production and assembly drawing for given components

Module – I


Module – II

Automobile Layouts and Circuit diagrams: Drawing the simple layout of service stations showing the details of departments, equipments and specifications. Drawing the general electrical wiring diagrams of various vehicles like Scooters Motor cycles and LMV. Drawing the wiring diagram of Ignition circuit, charging circuit, Starter circuit, Horn circuit, fuel gauge, oil pressure gauge and temperature gauge circuits

Module – III


References:

**Internal Continuous Assessment (Maximum Marks-50)**

- 50% - Tests (minimum 2)
- 30% - Assignments (At least 10 sheets covering the syllabus).
- 20% - Regularity in the class

**University Examination Pattern:**

*Examination duration: 3 hours*  
*Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A (40 marks)** - Four questions from Module I and II of 10 marks each. All questions are compulsory. There should be two questions from each module.

**Part B (60 Marks)** - Candidates have to answer one full question (Assembly drawing of Machine / Automobile Components) out of the two from module III. Each question carries 60 marks.

**Course Outcome:**

*At the end of the course, the students will be familiar with the detailed Component and assembly drawing along with standards of technical drawing.*
13.307 THERMAL ENGINEERING (MU)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objective:

To provide the students with a elementary ideas of applications of thermodynamics in engineering

Module – I

Steam engineering: T- S diagram, Mollier chart, Steam cycles- Rankine cycle, Modified Rankine cycle, Relative efficiency, Improvement in steam cycles-Reheat, Regenerative and Binary vapor cycle

Steam Boilers: Types of boilers –Cochran boiler, Babcock and Wilcox boiler, Benson boiler, La Mont boiler. Boiler Mountings and Accessoires.

Steam nozzles: Types of nozzle- Velocity of steam, mass flow rate, critical pressure ratio and its significance, effect of friction, super saturated flow.

Steam turbines: classification, compounding of turbinies-pressure velocity variation, velocity diagrams, work done, efficiency, condition for maximum efficiency, multistage turbinies-condition line, stage efficiency. Steam turbine performance-reheat factor, degree of reaction, cycles with reheating and regenerative heating, governing of turbines.

Module – II


Air standard cycle-Carnot cycle, Otto cycle; Diesel cycle, dual combustion cycle, comparison of Otto, diesel and dual combustion cycles. Stirling and Ericsson cycles, air standard efficiency, specific work output, work ratio; Actual cycle analysis, deviation of actual engine cycle from ideal cycle. Variable specific heats.


Module – III

Fuels and fuel combustion: Flash point and fire point, calorific value, Adiabatic flame temperature, Fuels for SI and CI engine, Important qualities of SI and CI engine fuels, Dopes,
Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas. Analysis of fuel combustion-A/F ratio, equivalence ratio, minimum quantity of air, flue gas analysis, excess air.

**Combustion in I.C. Engines:** Combustion phenomena in S.I. engines; Ignition limits, stages of combustion in S.I. Engines, Ignition lag, velocity of flame propagation, auto ignition, detonation; effects of engine variables on detonation; octane rating of fuels; pre-ignition; S.I. engine combustion chambers.

Stages of combustion in C.I. Engines; delay period; variables affecting delay period; knock in C.I. engines, Cetane rating; C.I. engine combustion chambers.

Pollutants from S.I. and C.I. Engines

**Module – IV**


**References:**


**Internal Continuous Assessment** *(Maximum Marks-50)*

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class
**University Examination Pattern:**

*Examination duration: 3 hours  Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course Outcome:**

After the completion of this course, students will get knowledge in the areas of engines, Gas turbine for a complete understanding of energy and other related engineering systems. It also provides students a feel for how thermal sciences are applied in engineering practice.
13.308 HEAT ENGINES LAB (U)

Teaching Scheme: 0(L) - 0(T) - 2(P)  
Credits: 2

Course Objectives:

- To strengthen the knowledge on heat engines and their performance testing by dynamometers.
- To make the students understand the testing of fuels and lubricants with appropriate equipments.
- To equip the students to carry out independent experiments, and to train them to analyse, report and infer the results.

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 and lubricants.
4. ASTM distillation test of gasoline
5. Determination of calorific values of liquid and gaseous fuels.
6. Study of different types of dynamometers.
8. Morse test on engines.
10. Drawing valve timing diagram,
11. Study of effect of Air fuel ratio, ignition timing on power, torque, SFC and efficiencies of engines.
12. Testing of Engines with different fuels with variable compression ratio – Measurement of mechanical efficiency, thermal efficiency, and SFC and comparision.
13. Test on air conditioning unit- determination of input, adiabatic efficiency, Isothermal efficiency and volumetric efficiency.
14. Test on heat Exchanger

Note: Students should complete at least 10 experiments from the above during the semester
**Internal Continuous Assessment** *(Maximum Marks-50)*

- 20% - Test/s
- 60% - Class work and Fair Record
- 20% - Regularity in the class

**University Examination Pattern:**

- Examination duration: 3 hours
- Maximum Total Marks: 100
- Questions based on the list of experiments prescribed.
- 80% - Procedure, conducting experiment, results, tabulation and inference
- 20% - Viva voce

Candidate shall submit the certified fair record for endorsement by the external examiner.

**Course Outcome:**

At the end of the course, the students will be familiar with the testing of IC Engines, fuels and lubricants.