

# Engine Engineering

Syllabus Number

1L202

Major Core Courses

Elective Requisites 2  
credit

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## 1. Course Description

Engines are composed of various disciplines and are used not only for automobiles but also in various fields. In this lecture, we will focus on basic matters mainly on automobile engines, and learn about the structure, function, operation and operation of engines and parts. You will also study the theory of cycle, combustion, specifications and thermodynamics. You will also learn the basics of rotary engines, gas turbine engines, jet engines and rocket engines.

This class is mainly a lecture style, but exercises are conducted in a pair work, etc., and the answers are presented by everyone to discuss the whole. In the 14th session, group work and presentations on the issues will be given.

And in this class, you will acquire knowledge, skills and attitudes about DP2, DP3 and DP4.

## 2. Course Objectives

Students acquire basic knowledge about the structure and function of various engines, the overall operation principle, and thermodynamics. The goal is to understand the engine and its importance as a power source for cars and industries. Students will acquire the theory of the engine and the ability to apply it, and will be able to envision the future of the engine for a sustainable society.

## 3. Grading Policy

Evaluate on final exam (80%) and midterm test (20%).

In addition, the answer will be explained after the examination and the intermediate test. An example answer is shown in LMS.

## 4. Textbook and Reference

Textbook

Teruo Sai Introduction to internal combustion engine engineering Ohmsha ISBN978-4-274-22082-1

Reference

Supervised by the Ministry of Land, Infrastructure, Transport and Tourism Auto mechanic training course textbook III Class 3 car gasoline engine Japan Automobile Development Association

Supervised by the Ministry of Land, Infrastructure, Transport and Tourism Auto mechanic training course textbook Second class gasoline car Engine Japan Automobile Development Association

Japan College of Automobile and Maintenance Colleges Japan Automobile College and Technical College Association Textbook Series No.6 Internal Combustion Engine, Fuel and Oil Japan College of Automobile and Maintenance Colleges

## 5. Requirements(Assignments)

As a preparation course, please read the class contents posted on the LMS and read through the applicable range of textbooks and reference books to understand the contents. In addition, some homework such as assignments will be shown almost every time, so please do it by the next round. Approximately one hour for preparation and two hours for assignments and reviews.

## 6. Note

Engine structure theory is an elective for the Automotive Engineering course.

A quiz will be conducted in the 7th session to confirm intermediate understanding. In addition to using the LMS for self-directed learning support, we will also implement Mobile-MARS test and questionnaire functions as an interactive class.

## 7. Schedule

- [1] Introduction What is an internal combustion engine?  
Preparation: read through textbooks P1-5 and understand the scope of study  
Review: Re-understand the contents of the lecture based on the LMS teaching materials. Also, if the assignment is assigned as homework, solve it.
- [2] Outline of reciprocating internal combustion engine  
Preparation: Reading through textbooks P7-21 and understanding the scope of study  
Review: Re-understand the contents of the lecture based on the LMS teaching materials. Also, if the assignment is assigned as homework, solve it.
- [3] Heat and thermodynamics  
Preparation: Reading through textbooks P23-P34 and understanding the scope of study  
Review: Re-understand the contents of the lecture based on the LMS teaching materials. Also, if the assignment is assigned as homework, solve it.
- [4] Internal combustion engine performance  
Preparation: Reading textbooks P35-45 and understanding the scope of study  
Review: Re-understand the contents of the lecture based on the LMS teaching materials. Also, if the assignment is assigned as homework, solve it.
- [5] Fuel and combustion  
Preparation: Reading textbooks P47-58 and understanding the scope of study  
Review: Re-understand the contents of the lecture based on the LMS teaching materials. Also, if the assignment is assigned as homework, solve it.

- [6] Gasoline engine-overview and body  
Preparation: Reading textbooks P59-78 and understanding the scope of study  
Review: Re-understand the contents of the lecture based on the LMS teaching materials. Also, if the assignment is assigned as homework, solve it.
- [7] Gasoline engine intake system, fuel supply system, cooling system, exhaust system [  
Preparation: Reading textbooks P79-94 and understanding the scope of study  
Review: Re-understand the contents of the lecture based on the LMS teaching materials. Also, if the assignment is assigned as homework, solve it.
- [8] Gasoline engine ignition system, electronic control system, power generation / charging system, battery, starting system  
Preparation: Reading textbooks P94-112 to understand the scope of study  
Review: Re-understand the contents of the lecture based on the LMS teaching materials. Also, if the assignment is assigned as homework, solve it.
- [9] Diesel engine-overview, combustion  
Preparation: Reading textbooks P115-119 and understanding the scope of study  
Review: Re-understand the contents of the lecture based on the LMS teaching materials. Also, if the assignment is assigned as homework, solve it.
- [10] Diesel engine fuel supply system, electronically controlled fuel injection pump  
Preparation: Reading textbooks P119-133 and understanding the scope of study  
Review: Re-understand the contents of the lecture based on the LMS teaching materials. Also, if the assignment is assigned as homework, solve it.
- [11] Diesel engine common rail fuel injection system, governor, timer, starter, supercharger  
Preparation: Reading textbooks P133-142 and understanding the scope of study  
Review: Re-understand the contents of the lecture based on the LMS teaching materials. Also, if the assignment is assigned as homework, solve it.
- [12] Rotary engine, special application internal combustion engine and hybrid system, gas turbine engine  
Preparation: read textbooks P143-168 and understand the scope of study  
Review: Re-understand the contents of the lecture based on the LMS teaching materials. Also, if the assignment is assigned as homework, solve it.
- [13] Jet and rocket engines  
Preparation: Reading textbooks P169-179 and understanding the scope of study  
Review: Re-understand the contents of the lecture based on the LMS teaching materials. Also, if the assignment is assigned as homework, solve it.
- [14] Presentation and general discussion on the issues  
Preliminary lesson: Learn about a given task and create a presentation or report  
Review: Investigate and review the subject again based on the content announced on the day of the lecture
- [15] Test, Summary