



# FSG3132 Gas Dynamics for Internal Combustion Engines 5.0 credits

Gasdynamik för förbränningsmotorer

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

## Establishment

Course syllabus for FSG3132 valid from Spring 2015

## Grading scale

## Education cycle

Third cycle

## Specific prerequisites

## Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

## Intended learning outcomes

After completing this course the student should be able to: explain basic concepts on thermodynamics, turbulence and compressibility and relate them with gas exchange processes and turbocharging flows; derive & interpret basic compressible flow relations; explain typical flow related instabilities in manifolds and rotational machineries; explain different experimental, computational approaches, and models suitable for assessing ICE gas dynamics; theoretical design of simple experimental or computational setups used for assessing flow instabilities related to ICE.

## Course contents

1. Overview on thermodynamics
2. Turbulence and turbulent flows (an overview)
3. Overview on compressible flow
4. Introduction to gas exchange in ICE
5. Rotating flows (effects on flow stability) and flow in complex conduits
6. Exhaust Gas Recirculation (EGR) assessment
7. Introduction to centrifugal compressors
8. Turbocharger thermodynamics / centrifugal compressor and turbine maps
9. Compressor Instabilities
10. Assessment of flow related to ICE gas exchange processes and turbochargers (experimental and computational)

## Disposition

The lecture part of the course is given in a compressed time scale with approximately 20h of lectures during 1-2 weeks.

## Course literature

R.H. Aungier, "Centrifugal Compressors: a Strategy for Aerodynamic Design and Analysis", ASME Press 2000.

J.D. Andersson, "Modern Compressible Flows", McGraw-Hill, 2003

Material that will be handed out

## Examination

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

## Other requirements for final grade

The following items have to be approved in order to obtain a pass on the course:

- Compulsory and active attendance during at least 80% of the lecture time
- Successful completion of homework assignment within given time frame

## Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.