EXCHANGE STUDY PACKAGE
FLUIDS & HEAT ENGINEERING

The exchange package on Fluids & Heat Engineering can be divided in two modules being the 2nd year Mechanical Engineering bachelor module "Fluid Mechanics & Heat Transfer" (15 EC) and a research assignment related to fluids engineering (15 EC). The module is based on project led education in which the learned theory is immediately applied in a project. The research assignment can be done individually or together with one or two other students in the field of computational fluid dynamics (CFD) or experimental fluid dynamics or aero-acoustics. The assignment is finished with a scientific paper and a presentation.

WHAT IS AN EXCHANGE STUDY PACKAGE?

Exchange Study Packages are balanced, coherent, well-structured, and self-contained sets of courses at a final Bachelor year academic level. Choosing one of these packages means you do not have to worry about selecting the right courses or managing your calendar to fit all of your classes. Simply apply for a package that suits your academic background and interest to be ensured of a well-balanced exchange programme, often consisting of 30 EC. These packages are generally accessible to students who have successfully completed the first two years of their Bachelor programme.

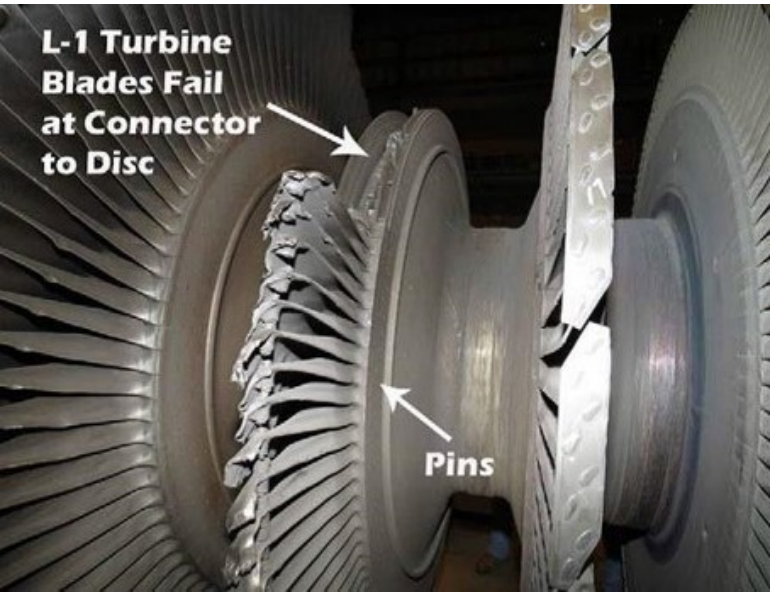
EXCHANGE STUDY PACKAGE

The first part of the exchange package concerns the module "Fluid Mechanics & Heat Transfer" which aims at understanding and being able to apply the disciplines of fluid mechanics and heat transfer in view of engineering problems. The module consists of three courses:

- Fluid Mechanics 1
- Heat Transfer
- Fluids Engineering (project)

Fluid Mechanics 1

Fluid mechanics is the discipline that describes the dynamics and mechanics of fluids (liquids and gases). Many applications are involved, such as computing forces on airplanes, determining the fluid velocity in an injection needle, the effects of a rough sea on the dynamics of a ship, making a wheather forcast or even describing trafic on roads.The purpose of the discipline is to describe characteristic variables such as velocity, density, pressure and temperature as functions of space and time.In the course Fluid Mechanics 1 the integral and differential formulations of the three conservation principles of mass, momentum and energy are derived. Limiting cases such as steady and inviscid flows are discussed. Several applications of the integral formulations are treated such as computing the force on a construction. Fully developed incompressible flows are introduced and the reduced Navier-Stokes equations are derived. Also introduced are the concepts



Experience Project Led Education at the University of Twente.

of dimension analysis, similarity and Reynolds number. Subsequently compressible flows are discussed based on a perfect gas modeling. Finally the concepts of total pressure, -density and -temperture are introduced.

Heat Transfer

In numerous engineering systems, the thermal management of great importance. The course Heat Transfer addresses the three mechanisms of heat transfer (conduction, convection and radiation) on the basis of practical applications. Because convective heat transfer takes place by means of the flow of gases and liquids, the essential basic phenomena in fluid dynamics are also discussed.

Project Fluids Engineering

In the project the theory on Fluid Mechanics and Heat Transfer are applied on an engineering problem e.g.:

- Design of an anti-icing system in an aircraft wing
- Design of a heat protection system for a spacecraft during reentry
- Design of a thermal barrier coating for a gas turbine vane

The project assignment is done in teams of 8 students. The project work consists of a literature study, numerical and analytical analyses, wind tunnel experiments, reporting and making and presenting a poster.

Reasearch assignment

The second part of the exchange package on Fluids & Heat Engineering is a Research Assignment. The aim of this assignment is to obtain in-depth knowledge of a specialised subject in the area of Engineering Fluid Dynamics, such as Magneto-Hydro-Dynamics, Geophysical Fluid Dynamics, Hydrodynamics of ships, Experimental or Numerical Aero-acoustics, Rotor blade Dynamics.

Learning goals

To be able to analytically compute the force by a flow on a construction To be able to check the physical dimensions
To be able to analytically compute a fully developed flow based on the reduced Navier-Stokes equations
To be able to compute temperature, pressure and density in a steady compressible flow
To be able to manipulate partial differential equations
To be able to perform dimension analysis
To apply the basic relations for the three heat transfer mechanisms (conduction, convection and thermal radiation) to steady situations.
Determine steady heat transfer rates
Determine unsteady temperature distributions inside objects
Explain how various relations can be derived from the conservation laws of mass, momentum and energy.
To be able to work and collaborate in a team.

MORE INFORMATION
TUITION FEES

To be paid at home institution.

ADMISSION CRITERIA

Solid background in Engineering, Mathematics and Design at 2nd year Bachelor level

STUDY LOAD

30 EC

START

Spring Semester

For more information about this Exchange Study Package, contact the Departmental Exchange Coordinator of the **Faculty of Engineering Technology**
utwente.nl/go/exchange-coordinators