Symposium Fontys Engineering Physics

June 12th 2019

Fontys

HOGESCHOOL
TOEGEPASTE
NATUUR-
WETENSCHAPPEN

Program

13.45	Coffee and tea		R1.01
14.00	Welcome	Ellen Moerman	R1.01
14.05	Rondom de Rondom	Martijn van Schalkwijk	R1.01
14.20	Special Interest Group - Solar Fuels	Peter Thüne	R1.01

	R1.01	R1.11	R1.12
14.45 (first round)	ASIA_TN19_023 From vacuum flask to calorimeter	ASIA_TN19_M10 Realisation of a readout system for a gamma radiation unit	ASIA_TN19_024 Developing a monitoring method for stress related repetitive movements
15.30 (second round)	Preparation for 16.1 5	ASIA_TN19_M14 Mondomed Foam	ASIA_TN19_020 BK Connect
16.15 (third round)	ASIA_TN19_M11 GLOW R.I.P	ASIA_TN19_M15 Ultrasound learning model	ASIA_TN19_022 Characterisation of a Laser Diode Chip

17.00	KIVI	Job Visser	R1.01
17.15	KIVI award		R1.01
17.30	Drink		Aula R1

The KIVI Nomination for the Fontys KIVI AWARD

KIVI wants to congratulate all the students who have successfully completed their project today. KIVI is the Dutch association for engineers and engineering students. With 20.000 members KIVI is the largest engineering association in the Netherlands. All engineering disciplines are organized within KIVI.
A must for every Young Professional to find his or her way in the world of Engineering.
As such we are also very interested in what the future engineers of Fontys University are achieving in their projects. We are proud and enjoy that we can be present today during the presentations of your projects.
This year KIVI will make the KIVI 2019 prize available for the best project.
The team members of the chosen winning project will be rewarded with the KIVI AWARD 2019.
As the network body for engineers and other highly educated technical professionals in the Netherlands, KIVI's primary objective is to promote the importance of the role of engineers in technology within our society. This ensures continuity in adequate investment in education, research and innovation. To meet this objective, KIVI conducts the following core activities:

• **Technical promotion** – to promote the role of technology and engineers in general
• **Network** – to stimulate contacts and exchange of knowledge between engineers
• **Member services** – to provide services that assist members with the development of their professional careers KIVI provides professional services to its members all over the world and organizes a large number of activities throughout the year. Of course this also counts for engineers from abroad who wish to work or study in the Netherlands.

From KIVI South
dr.ir. J.M. (Jan) Vleeshouwers
dr.ir. E. (Eric) Persoon
www.kivi.nl

Solar Fuels: Fontys – Differ and the Energy Transition

The inevitable transition from our coal/natural gas/oil driven economy towards sustainable and CO2 neutral represents one of the pivotal challenges for our society in the coming years. To meet these challenges we need breakthroughs towards new or drastically improved technology and – evenly important- trained professionals to develop, implement, install and maintain these technologies. We at Fontys is ready to play our part.

In close cooperation with Differ (Dutch Institute For Fundamental Energy Research) and other partners we work hard to develop ourselves into a knowledge/research and training center for applied research in the field of Solar Fuels and new energy technologies. We stand at the very beginning but this development offers opportunities to enthusiastic (Fontys) students to form interdisciplinary teams and take on real life research challenges. Concrete examples include water electrolysis, to produce sustainable hydrogen, and the splitting of CO2 using a plasma reactor.

Rondom de Rondom

In this presentation Martijn van Schalkwijk, projectmanager, will explain what the starting points were for the new building. Because it’s not just a new building but also the start of a more intensive cooperation between the technical educations. You will also get a small glimpse of the state of the art technical facilities we’re building for Applied Physics.

Introduction

The research and development projects of TN are always based on actual societal problems. They are mainly organized through the TNW “lectoraat” Applied Natural Sciences.

The Applied Natural Sciences research group actively cooperates with companies and other knowledge institutions in various research projects. It is organized into six “Special Interest Groups” (SIGs), where the typical TN assignments mainly fall under the SIG “Detection & Measurement”. The ASIA projects of this year are all from the research lines within this SIG. Within the SIG “Detection and Measurement” there are research lines in the field of Acoustics, Photonics, Medical Technology and Creative Physics.

BK Connect

ASIA_TN19_020

BK Connect is a combination of software and hardware. It can be used to both acquire signals from connected sensors and analyse the acquired data. BK Connect will be used to further educate students of the fourth semester of the Fontys University of Engineering Physics in vibration measurements and its applications. In particular, how vibrations can be used to detect faults in mechanical equipment.

After students are introduced to the program and understand its functions and lay-out, students will be asked to compare the results of two vibration measurements. The first is the measurement of a impact drill in good working condition. The second measurement consists of the same drill and the same kind of measurement, only with an artificially introduced imbalance. The measurement is done by slowly increasing the rotational speed of the drill till the maximum velocity is reached. This level is then maintained for a few seconds, after which the rotational speed is slowly decreased back to zero. The tool used to exemplify to difference between the two measurements will be a FFT System vs Time analysis.

In order to ensure that the experiment is executed as designed, manuals are written. One manual is written for the students and contains the basic theoretical knowledge required and the assignments that are to be fulfilled. The second manual is purely for the teachers and has a step by step description as to how the measurements are to be executed.

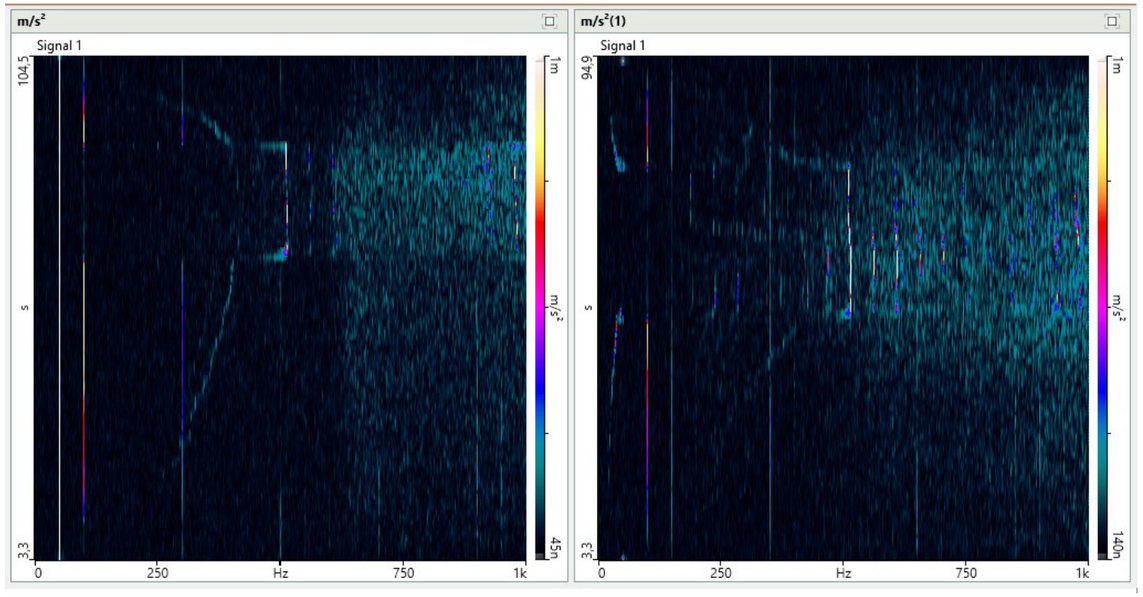


Figure 1A: Two graphs, the left graphs is of the drill in working condition, the right graph has an added imbalance.

ENGINEERING PHYSICS

Students:

Mees Bieling	**Fontys School of Natural Sciences Engineering Physics**
Jan Derks van de Ven	**Fontys School of Natural Sciences Engineering Physics**
Stan van der Voort	**Fontys School of Natural Sciences Engineering Physics**
Jan Schoenmakers	**Fontys School of Natural Sciences Engineering Physics**
Jaimy van Soerland	**Fontys School of Natural Sciences Engineering Physics**
Client:	**Fontys University of Applied Scienes**

Fontys
University of Applied Sciences

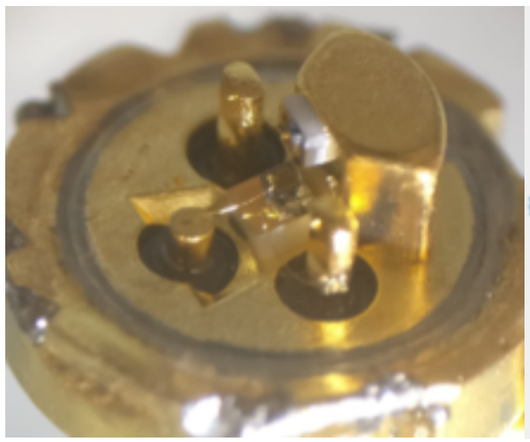
Contact at Client:	**Ir. A.F.P. Dommels**
Fontys Coach:	**Ir. A.F.P. Dommels**

Characterisation of a Laser Diode Chip

ASIA_TN19_022

In today's world of increasing telecommunication, the Internet is indispensable; Almost everyone uses it. A fast and reliable way for data transport is important. The company VTEC develops and produces lasers that are used to control a light signal in an optical fiber. The assignment for the project is to develop a measurement method that can quickly and reliably determine important laser characteristics. For example, the setup must be able to determine a voltage-curve, a luminous intensity curve, and the optical spectrum as a function of the given electrical current. In the current state of the project, it is possible to create a working setup with which these characteristics can be determined accurately. Also, theoretical research about lasers and measurement methods is conducted for future project groups to continue this project.

The presentation deals with how we have tackled the problems in the project and how our measurement setup is structured. Next, we show the measurement results that are possible to measure with the current setup.



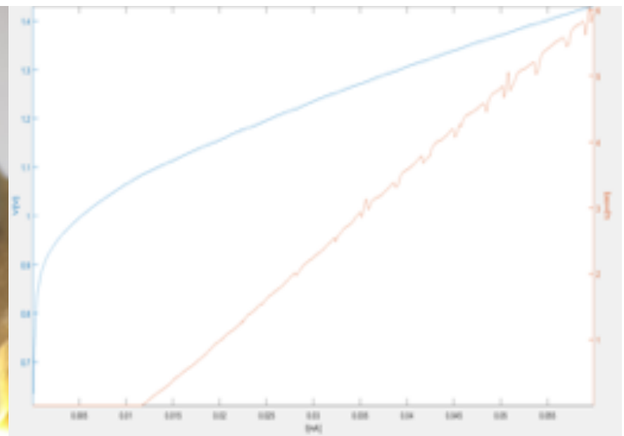


Figure 1: Laserdiode (on the white bit) shown inside an open package
Figure 2: LIV curve.

ENGINEERING PHYSICS

Students:

Mrs. Marleen Aaldering	**Fontys School of Natural Sciences Engineering Physics**
Mr. Luc Brands	**Fontys School of Natural Sciences Engineering Physics**
Mr. Max Coppers	**Fontys School of Natural Sciences Engineering Physics**
Mrs. Femke van Eck	**Fontys School of Natural Sciences Engineering Physics**
Mr. Mike Faassen	**Fontys School of Natural Sciences Engineering Physics**
Mr. Remco Mulders	**Fontys School of Natural Sciences Engineering Physics**
Mr. Floris Pronk	**Fontys School of Natural Sciences Engineering Physics**
Client:	**VTEC**
Contact at Client:	**Mr. Jan Mink**
Fontys Coach:	**Saskia Blom**

From vacuum flask to calorimeter

ASIA_TN19_023

In the first and third year of the Engineering Physics course, experiments are performed related to thermal-fluid sciences using a calorimeter. The current calorimeter cannot achieve the required accuracy of a 5% maximum error. A vacuum flask is thought to be able to perform more efficiently compared to the old calorimeter. After initial measurements, the efficiency was confirmed and the vacuum flask is expected to be able to measure the specific heat within an accuracy of two percent.
Thus, the goal of this project is to develop an experimental setup using the vacuum flask as a calorimeter, to measure the specific heat a material with an accuracy of two percent or less.

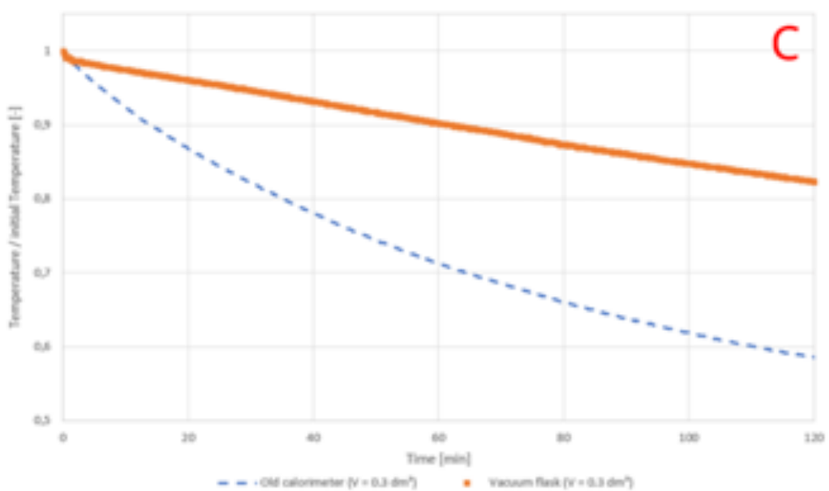


figure 1A: the front of the vacuum flask;
figure 1B: the inside of the vacuum flask;
figure 1C: The cooling curvatures of the old calorimeter and the vacuum flask, when both are filled with 0.3 dm³.

ENGINEERING PHYSICS

Students:

Rune Alofs	**Fontys School of Natural Sciences Engineering Physics**
Wessel Bouterse	**Fontys School of Natural Sciences Engineering Physics**
Paul Huijberts	**Fontys School of Natural Sciences Engineering Physics**
Vera Schroen	**Fontys School of Natural Sciences Engineering Physics**
Client:	**Fontys University of Applied Scienes**
Contact at Client:	**Helger van Halewijn & Tanja Briels**
Fontys Coach:	**Jacomien Brocaar**

Developing a monitoring method for stress related repetitive movements

ASIA_TN19_024

Now that everyone in this world is getting busier, stress related complaints are more common. In some cases, the experience of stress is associated with unconscious movements, for example leg shaking or body rocking. In addition to the fact that stress can be measured from (vital) body functions, these stress-related repetitive movements (SRRM) can be measured with accelerometers. It is possible to use the accelerometers of a mobile phone, carried in a pocket, to measure various SRRM.

Thus, the goal of this project is to measure the daily dose of SRRM using the accelerometer of a mobile phone. It is desirable to integrate both the detection of repetitive movements and the representation thereof in an application.

Various measurements have been made in which a random person has deliberately performed a certain repetitive movement. Then the data is used to create an application that can distinguish the movements from each other and can determine which movement has been performed. Two applications are made, one using statistical analysis and one using machine learning. These applications will finally be compared with each other to determine the best detection method.

Graphical representation of some compulsive movements

ENGINEERING PHYSICS

Students:

J.W. Bloem	**Fontys School of Natural Sciences Engineering Physics**
K.M.M. Goeloe	**Fontys School of Natural Sciences Engineering Physics**
C.P. Kuijken	**Fontys School of Natural Sciences Engineering Physics**
M.H. Scheele	**Fontys School of Natural Sciences Engineering Physics**
Client:	**Fontys University of Applied Scienes**
Contact at Client:	**Dr. Ir. G.R. Langereis**
Fontys Coach:	**Dr. Ir. G.R. Langereis**

Realisation of a readout system for a gamma radiation unit

ASIA_TN19_M10

To start, this project is a multidisciplinary project. This means that students from multiple studies work on the same project together. A Fontys IPD and an EXPO student group have worked during the second semester of 2017-2018 and first quarter of 2018-2019 on the gamma radiation readout system comprising a high voltage power supply and a readout unit.
The purpose of the project is to construct a working readout system for the gamma radiation unit. This asks knowledge about radiation and the physical aspects of radiation as knowledge about the making of a readout unit.

Gamma Radiation Unit

MIXED

Students:

Nico Berends	**Fontys School of Natural Sciences Engineering Physics**
Thomas Groeneveld	**Fontys School of Natural Sciences Engineering Physics**
Michael Burgmans	**Fontys School of Natural Sciences Engineering Physics**
Ivan Cortes	**Fontys School of Engineering Electrical Engineering**
Sònia Bergnes	**Fontys School of Engineering Electrical Engineering**
Client:	**Maastricht UMC+**
Contact at Client:	**Roel Wierts**
Fontys Coach:	**Wiely van Groningen**

Ruthless Innovating Planet – A Showpiece for GLOW 2019

ASIA_TN19_M11

Every year Fontys is asked to organise and create a showpiece to show at the annual light festival GLOW in Eindhoven. This year the group of students that works on this showpiece is interdisciplinary. Students come from the Mechatronics, Engineering and Engineering Physics departments of Fontys University of Applied Science in Eindhoven. The project is guided by Ellen Moerman, teacher and Fontys employee, and Tom Weerts, GLOW production manager. The project is supported partly by KAW Architects Eindhoven.

After a period of brainstorming and idea-elimination, one idea has been chosen to become the GLOW showpiece. The showpiece is called Ruthless Innovating Planet. This showpiece will be built to tell a story about energy misuse and the effect of the overconsumption of fossil fuels. Its message is a strong one, fitting in this time where people regularly make statements about the environment.

The goal of the showpiece is to make GLOW visitors think about how the world revolves mainly about wealth and a growing economy. One of the main motors of the economy is the fossil fuel-industry. Even though much attention has already been given about reducing the consumption of fossil fuels in the past, they are still responsible for powering the majority of worldwide industry. This is also because loads energy is “misuse” in terms of efficiency. Therefore the message that the showpiece communicates, has to leave a big impact on the GLOW visitors. To accomplish this, the showpiece itself is larger than life.

In the first place a large sphere with a 3,2 m diameter is hung above a lake of fake fire which is created with a fire effect using a fog machine and orange coloured lamps. Below the fire, four truck-engines are placed, which seem to fuel the lake of fire. In summary: a sphere is suspended over a lake of fire, produced by the (misused) energy of the four engines. The sphere is constructed as a lattice work that resembles the equatorial and meridian lines of earth as they appear on globes. Therefore the sphere represents earth. It is in fact a somewhat abstract depiction of earth. In the image included with this text a conceptual drawing is found. The message is clear: The planet will soon burn up due to society’s current view on innovation and energy (mis)use.

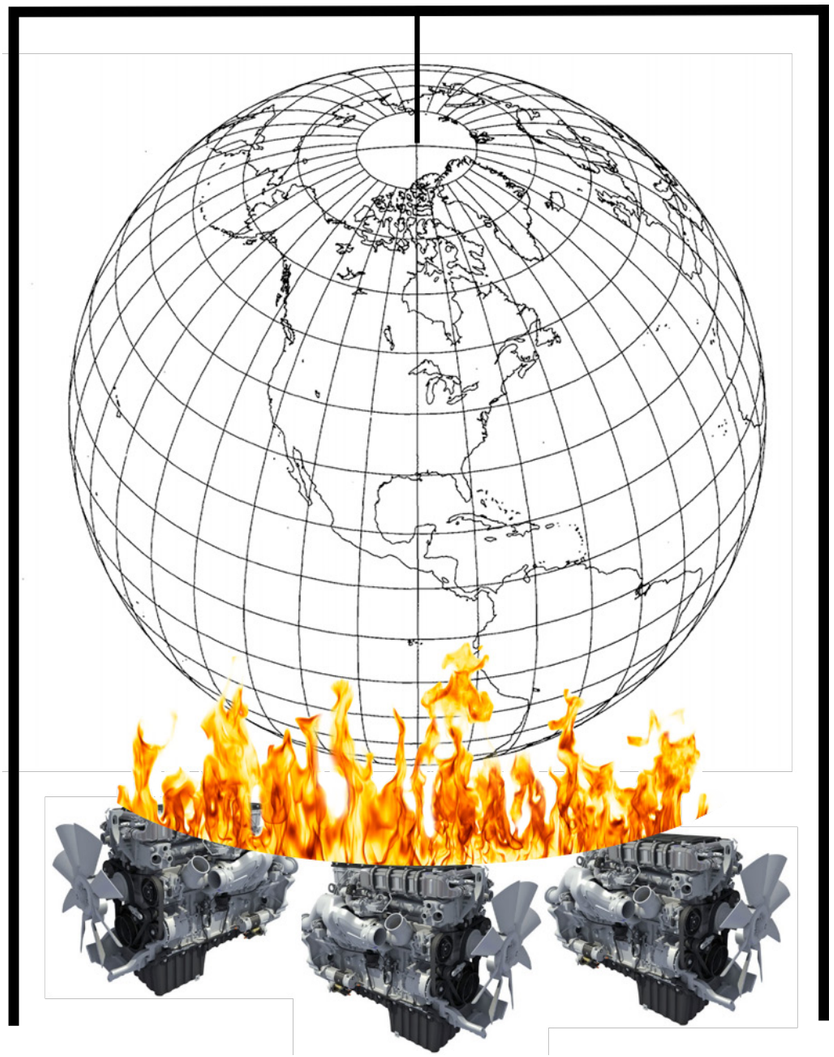
Students:

Fontys School of Engineering - Engineering
Nick Paijens, Kwaku Kyei

Fontys School of Engineering - Mechatronics
Rikkert Lensen, Yannick van der Loop

Fontys School of Natural Sciences - Engineering Physics
Koen Meijerink, Niek Neuraij, Victor Snels, Koen van der Merwe

Client: **Fontys University of Applied Scienes GLOW Eindhoven**



Mondomed Foam

ASIA_TN19_M14

The project is a research project in order of MONDOMED. MONDOMED is a medical supply company specialised in PVA foam. MONDOMED is already producing a PVA foam used for medical gauzes. MONDOMED wants to make the gauze applicable for abdominal surgery. This means the gauze has to be X-ray detectable. The gauzes currently used are made of cotton and are woven with a barium sulphate doped wire. The barium sulphate is a good X-ray contrast which makes the wire clearly visable on a X-ray. The problem of using the same technique is the implementation of this type of wire in the PVA foam. The focus of this project is thus to make the foam X-ray detectable. We have split the group in to two sub-groups. The first group focusses on possible ways of implementing the barium sulphate wire. This in contrast to the second group which focusses on other ways of making the foam X-ray detectable.

MIXED

Students:

Mark Waterlaat	**Fontys School of Natural Sciences Engineering Physics**
Jeroen Vos	**Fontys School of Natural Sciences Engineering Physics**
Susan Mangnus	**Fontys School of Natural Sciences Engineering Physics**
Tom van Loon	**Fontys School of Natural Sciences Engineering Physics**
Sander Rutten	**Fontys School of Engineering Mechanical Engineering**
Tim Fonken	**Fontys School of Engineering Mechanical Engineering**
Daniel Ringelberg	**Fontys School of Engineering Mechanical Engineering**
Rutger Snoek	**Fontys School of Engineering Mechanical Engineering**

Creating a ultrasound Doppler phantom of a carotid artery

ASIA_TN19_M15

Students following the Medical Imaging and Radiotherapeutic Technology (MBRT) training learn how to use ultrasound equipment to recognize deviations and diseases in humans.

Currently, students practice ultrasound on themselves, or each other, to search for different arteries and veins. The students also have a few phantoms which have some solid objects in the phantoms for the students to find. The biggest problem is that most of the students are generally healthy, which means they rarely see deviations or diseases. After finishing the MBRT course, the students spent a lot of time recognizing diseases or defects in for example hospitals. Our client wants to teach the students how to recognize deviations during the course, so they do not have to teach it themselves after the course.

At the moment there are various ultrasound phantoms on the market with certain deviations in them which the student could practice with. However, these phantoms are very expensive (in the range of 10.000 euro's). Because of this price tag, our client from MBRT asked our department to create an ultrasound phantom of the carotid artery, on which Doppler velocimetry imaging can be performed.

The Doppler velocimetry imaging is a way to measure the velocity of the blood flow in arteries and veins, using the Doppler Effect. Also we will specify on the carotid artery because the carotid artery can have one of the most common diseases which is narrowing in the arteries.

Ultimately, we would like to make a Doppler ultrasound phantom with a healthy carotid artery as well as an unhealthy carotid artery. This will give the student a clear image of the difference between the two carotid arteries.

To create an image that is comparable with a carotid artery, it is important that the synthetic tissue in the ultrasound phantom resembles the human body. In this process we used a few different materials: gelatin and silicone. These two materials give a representation of the human tissue, with a hole in it to simulate the carotid artery.

The group before us used a lot of gelatin but the problem is that gelatin will mold after a while, that is not a long term solution. We used mostly silicone because it can be made in every form and also has the same structure as human tissue.

MIXED

Students:

Steven Frankowski	**Fontys School of Engineering Engineering**
Fadhly Sukawidjaja	**Fontys School of Engineering Engineering**
Jesse Roomer	**Fontys School of Natural Sciences Engineering Physics**
Daan Rabelink	**Fontys School of Natural Sciences Engineering Physics**
Daan Gussen	**Fontys School of Natural Sciences Engineering Physics**
Client:	**Fontys University of Applied Scienes**
Contact at Client:	**MsC. Lambert Baken (Fontys MBRT)**
Fontys Coach:	**Ir. S. Voorn (B of Health)**

To create the blood flow in the ultrasound phantom a pumping system is created. The blood is created with a kind of water with little particles in it because otherwise the Doppler imaging will not work. The blood flow is created with a motor and a piston cylinder system, to create the pulsing flow of the heart.

With our whole system (pump and phantom) and the Doppler ultrasound imaging, the student can see the 'fake' blood running through the carotid artery with narrowing (phantom) with a heart pulse flow. With this system we save the school a lot of money and we can adjust the system to their wishes. And we help the student to find diseases with ultrasound and give them a head start in daily life.