Join us at the

FACULTY OF TECHNOLOGY, INNOVATION & SOCIETY!

Courses offered in English (2019-2020)
CONTENTS

About the Faculty of Technology, Innovation and Society 4

European Project Semester 6
EPS International Project part 1 & 2 8
EPS Smart Manufacturing and Robotics 10
EPS Sustainable Urban Engineering 12
EPS (Sustainable) Packaging Design and Innovation 14

Regular minors 16
Embedded Systems part 1 & 2 16
Robotics and Vision Design part 1 & 2 18
Assistive Devices 20
Energy Transition 22
Climate Change in International Perspective 23
The Many Faces of Globalization 24
BE SMART: Strategies for Smart Sustainable Cities 25

Design minors ✦ 26
Prototyping and Craftsmanship 26
Design with Nature 27
Economics of Mass Production 28
Entrepreneurship 28
Exploring New Technologies 28
Product Engineering 28
Responsible Design 28
Smart Objects 29
Service Design 29

Studying in The Netherlands 30
Campus life 30
More information 30

* For these design minors, a major in design is required. For more information, please send an email to tis-international@hhs.nl.
### COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Term 1</td>
<td>Term 2</td>
</tr>
<tr>
<td></td>
<td>Sep-Nov</td>
<td>Nov-Feb</td>
</tr>
<tr>
<td>EPS International Project part 1 &amp; 2</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>EPS Smart Manufacturing and Robotics</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>EPS Sustainable Urban Engineering</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>EPS (Sustainable) Packaging Design and Innovation</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Embedded Systems part 1 &amp; 2</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Robotics and Vision Design part 1 &amp; 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assistive Devices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Transition</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Climate Change in International Perspective</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Many Faces of Globalization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BE SMART: Strategies for Smart Sustainable Cities</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Prototyping and Craftsmanship</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Design with Nature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economics of Mass Production</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Entrepreneurship</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Exploring New Technologies</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Product Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsible Design</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Smart Objects</td>
<td>●</td>
<td></td>
</tr>
</tbody>
</table>

### DISCLAIMER

The information contained in this guide is, to the best of our knowledge, true and accurate at the time of publication and is solely for information purposes. Changing circumstances may cause alterations in its outline at any time. The programme of The Hague University of Applied Sciences accepts no liability for any loss or damage howsoever arising as a result of use or reliance on this guide or on the information thereon or in respect of information accessed via any links from the Web pages.
About the Faculties of Technology, Innovation and Society

The world faces big challenges and we are looking for new answers and technical innovations to solve them. We need to be critical and look ahead to make improvements to the world we live in, from harnessing renewable energy supplies for sprawling cities to using robots to improve quality of life.

At the Faculty of Technology, Innovation and Society (TIS), students work on real life commissions from businesses and government organisations to help make a better world, working alongside multidisciplinary students in an international setting.

International programmes

The Faculty of Technology, Innovation and Society offers a range of international programmes. These include bachelor's taught in English, minors, exchanges and four European Project Semester (EPS)

International minors

Co-production, reflection, networking, energy and inspiration are at the core of our international minors.

For example, in our Climate Change minor, students examine this crucial issue from an international perspective. While they learn to innovatively deploy robots in industry, agriculture and care in our Robots and Vision Design minor.

Did you know that embedded systems are found in many devices and applications, for example, washing machines, telephones, heating devices, cars, medical appliances, measuring devices and internet connected devices? Students can discover more on the two-part Embedded Systems minors. Or delve into the creativity, production, design, ergonomics and marketing of packaging on Packaging Design and Innovation.

If you are interested in studying a minor at the study programme Process and Food Technology, please send an email to tis-international@hhs.nl.

Exchange programmes

An exchange at THUAS is a truly international experience. THUAS welcomes more than 500 exchange students from around 50 nationalities every academic year. Our academic year is divided into two semesters, which start in September and the end of January.

All exchange students must be proficient in the English language. Exchange students can choose from the subjects offered within a faculty, or select one or more of our minors. These 15 ECT courses are available to all students at THUAS, including exchange students.

Our exchange students gain a rich cultural experience by working alongside the large number of international full-time students on English-language bachelor degree programmes. Our high-quality programmes encourage students to explore each other’s cultures to become open-minded and independent thinkers - essential qualities in today’s market. Working in a multicultural and cosmopolitan environment becomes second nature to our students.
The Faculty TIS has two campuses:

The Hague and Delft. Each location has its own character. The main campus in The Hague is the largest and characterized by a vibrant and international atmosphere. The campus in Delft is located on the premises of TU Delft. Please note on which campus your course takes place.
EUROPEAN PROJECT SEMESTER

EPS
The European Project Semester (EPS) programme is offered by 18 European universities in 12 countries to students who have completed at least two years of study. EPS is aimed at engineering students, but students on engineering projects are also welcome.

EPS is design orientated and arms students with all the necessary skills to face the challenges of today’s world economy.

It incorporates a blend of projects and problem based learning. You’ll work in international and interdisciplinary teams on assignments. Some of these are run in partnership with businesses and industries. You’ll learn to take responsibility for your project work and develop your inter-cultural and communication skills.

Please note that for all EPS programmes the following documents are needed when you apply.
1. Motivation Letter
2. Curriculum Vitae
3. Transcript of records

You can send the documents to eps@hhs.nl

EPS subjects
The Faculty of Technology, Innovation and Society offers four EPS subjects, which will be explained in the following pages:

- International Project 1 + 2 (Urbinn, FC)
- Smart Manufacturing & Robotics
- Sustainable Urban Engineering
- Packaging Design & Innovation + Sustainable Packaging Design & Innovation
10 FACTS ABOUT EPS

1. Taught in English
2. Teamwork is the main focus
3. Students work in groups of three to six with at least three nationalities represented
4. Projects are multidisciplinary
5. A semester is worth 30 ECTS and lasts around 15 weeks
6. A project is worth a minimum of 20 ECTS, with subjects worth between 5 and 10 ECTS
7. Subjects support the project and include English and a basic course in the local language
8. Teambuilding and project management are included at the beginning of an EPS semester
9. Project supervision focuses on process as well as the product
10. EPS is continually assessed and includes an interim and final report
INTERNATIONAL PROJECT

Sustainable Mobility

This EPS is made up of two international project minors. Students work in international engineering teams on complex, multidisciplinary projects to expand their professional knowledge in project management, engineering and support processes (marketing, communications, human resource management, public relations, finance, fundraising etc.).

Students can participate in one of two ‘Living Lab’ projects - Formula Cruisers and Urbinn. These project assignments are subject to change because they are based on demand from relevant industries and relationships with other institutions.

Formula Cruisers

“It’s great working on a project with an international team from different cultures, learning about different places and how we do things differently.”

Callum Jones, 21
Nottingham Trent University, UK

On the Formula Cruisers minor, you'll get the chance to be a part of the team designing and building an electrical racing car to compete at the Silverstone racing track in the UK and even Germany and Austria.

Urbinn

“We get the opportunity to take initiative and be creative and there’s freedom to explore new ideas.”

Laura Tudorie, 23
University Politehnica of Bucharest, Romania

This sustainable urban vehicle project looks at solving issues of congestion and pollution with an innovative electric powered car designed to transport people and cargo in Delft.

The goal is to improve the lives of billions of people in the urban environment in 2025 using state-of-the-art technology.

Content

This minor is the first of two minors. This minor is continued by the minor International Project 2 (IP2). In the environment of a complex multidisciplinary engineering project students originating from several European and non-European countries will broaden and/or deepen their professional knowledge and skills depending on their discipline, interest and experience within one of the three main processes of the project, i.e. project management, engineering and support. The added value of these type of projects for students is the experience of working in a team that is both international and multidisciplinary.
Objectives

1. Project Management
Managing the team members in the engineering and support processes on the strategic level and on the operational level. This means setting up and controlling vision, mission, strategy, planning and control on the basis of all kinds of budgets (mass, energy, volume, finance, ...). Performance control of all engineering and support processes, meaning diagnosing of and intervening in these processes.

2. Engineering
Depending on the phase of the project and the discipline of the student (mechanical engineering, electronics, computer science, physics, mathematics, mechatronics, etc, etc) he/she will make a contribution to the orientation phase (setting system and subsystem requirements), design phase (ideas, concepts, designs), construction phase (procurement, assembling, production), application or consumers phase (performance, participating international contests).

3. Support
The support processes are in the domains of marketing, communication, information management, human resource management, public relations, finance, fund raising etc. Students will develop business objectives, plans of approach and execute them.

4. Personal development
Reflection on own performance using the Strengthsfinder model for talent themes.

The added value of these type of projects for students is the experience of working in a team that is both international and multidisciplinary. Students need to learn to deal with the complexity of the project that arises from the strong entanglement between the disciplines (and thus the personal assignments of the students) and the level of ambition (mostly international contests and/or the application of advanced technologies) as well as with different cultural perspectives among the project members.

‘Standard’ competencies are thus broadened in a highly ambitious environment. This implies the development of both technical knowledge and (inter) personal and cross-cultural skills to the next level.

Entry requirements
Students send in an application letter including a detailed portfolio/CV and grades. They will be matched with available assignments within specific projects after a mandatory interview with the senior project leader. Applicants must be able to demonstrate a good command of spoken and written English.

Teaching methods + Study load
Study load is 420 hrs:
- Personal Coaching: 24 hrs
- Project Management Courses: 86 hrs
- Project Work: 276 hrs
- Languages & Culture: 28 hrs
- Social Activities: 6 hrs

Subject themes
- Economics & marketing
- Technology and Design
- Computer Science
- International themes
- Management, organization, human resources
- Public relations

Contact
Peter Menger
p.menger@hhs.nl
+31 15 260 6241
+31 6 2077 0154

<table>
<thead>
<tr>
<th>International Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level</strong></td>
</tr>
<tr>
<td><strong>Length</strong></td>
</tr>
<tr>
<td><strong>Language</strong></td>
</tr>
<tr>
<td><strong>Study credits (ECTS)</strong></td>
</tr>
<tr>
<td><strong>Location</strong></td>
</tr>
</tbody>
</table>
| **Osiris code** | TBK-HMVT14-IP1  
TBK-HMVT14-IP2 |
EPS MINOR
SMART MANUFACTURING AND ROBOTICS

This award-winning international EPS is taught in two parts, both based in Delft. You’ll get the opportunity to build state-of-the-art automotive prototypes for the industry.

Content
The global competitive landscape of manufacturing is rapidly changing due to the onset of advanced manufacturing technologies. Smart manufacturing combines the advantages of mass production and piecewise production to bring about a fundamental change in the way production processes designed, built and executed.

This industrial robot automation focused minor prepares you -by hands- on practice and theory – for this change. You will learn to design and simulate an entire factory as well as program our own industrial robots.

For more information and past projects, please refer to: http://www.robotminor.nl.

Objectives
After completing this minor the student has the following abilities:

- Program actual industrial robots;
- Integrate robots into production lines;
- Create machine vision solutions;
- Professional client contact;
- Design factories.

Learning to deploy robots in manufacturing environments. Gaining practical knowledge and skills in programming production robot setups and implementing the use of vision, external sensors, actuators and machine learning in these setups

Entry requirements
- Basic knowledge of production technologies
- 90 ECTS (propedeuse/first year points do not count)
- Sufficient English to participate in group work, understand lectures and written materials

International students may enrol after three years (or with an equivalent of 135 ECTS) of university education (including first year points). Students must have a basic but broad understanding of materials engineering. They should have proven technical design and group project work skills and completed one or more internships in industry.
**Teaching methods + Study load**

The minor consists of two projects of 10 weeks. In the first 2-3 weeks of each project, courses and practices are taught to get the students quickly acquainted with the hard- and software skills to successfully finish the projects. If you pass your project, you will have week 10 and 20 off.

EPS cluster project 1 “Implement a real robot in a real production line” (total: 8 ECTS)

7 ECTS*: various practicums and tutorials on state-of-the-art robot control, vision, programming, designing and intercultural teambuilding.

- Lectures and practicums: full-time for the first 2-3 weeks
- Tutoring, 4-8 hours per week
- Project: full-time for the remaining weeks

EPS cluster project 2: “Implement a real robot in a real, more advanced production line” (total: 10 ECTS)

5 ECTS*: various practices and tutorials on state-of-the-art machine learning, sensors data processing, joining and intercultural teambuilding

- Lectures and practicums: full-time for the first 2-3 weeks
- Tutoring, 4-8 hours per week
- Project: full-time for the remaining weeks

*Specific course content dependent on projects and student group needs.

You will get two projects and two sets of practicals to make a total of 30 ECTS.

**Contact Hours**

Approximately 15 hours per week.

**Subject theme**

Technology & Design

**Contact**

T. Brilleman  
+31 15 260 6270  
t.brilleman@hhs.nl  
www.smrdelft.nl

<table>
<thead>
<tr>
<th><strong>Smart Manufacturing and Robotics</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level</strong></td>
<td>Undergraduate</td>
</tr>
<tr>
<td><strong>Length</strong></td>
<td>2 x 10 weeks</td>
</tr>
<tr>
<td><strong>Language</strong></td>
<td>English</td>
</tr>
<tr>
<td><strong>Study credits (ECTS)</strong></td>
<td>30</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>Delft</td>
</tr>
<tr>
<td><strong>Osiris code</strong></td>
<td>W-HMVT18-SMR</td>
</tr>
</tbody>
</table>
EPS MINOR
SUSTAINABLE URBAN ENGINEERING

This EPS is all about improving urban wellness by creating a multifunctional urban construction design for future cities.

Content

The main task is to create an initial design and 25-year project plan for a multifunctional urban construction with farming, working and living functions. The initial design and project plan contains the architectural, engineering and managerial solutions to make an energy-positive, sustainable, circular proof and long-term economically feasible urban infrastructure.

Three modules are offered during the semester:

- Smart Design
- Building Systems
- Sustainable Exploitation

The modules are divided in two phases: basic knowledge and in depth knowledge. In the first six-week phase, all students follow the three modules. In the second phase of 10 weeks, students can choose their courses.

Objectives

Students apply the knowledge and insight gained through their own study programmes within a multidisciplinary team, required in the planning and design of a multifunctional urban construction.

Entry requirements

Students apply the knowledge and insight gained through their own study programmes within a multidisciplinary team, required in the planning and design of a multifunctional urban construction.

Students from other disciplines with an affinity for the course can also register with approval from the programme coordinator.
There is a commissioning party from outside the university (a client), and students play their own role (consultant in their own discipline). Students are coached on the process (2 coaches) and on subject content (one contact person per discipline).

Systems engineering and multidisciplinary design methods are common themes that run throughout all subjects.

Three modules are given at the level of introductory courses:

- Smart Design
- Building Systems
- Sustainable Exploitation

Specialization in each discipline is offered through the in-depth modules of the second semester phase.

The basic modules make use of blended learning. Part of the content is to be learned and assessed via short assignments digitally previous the lecture. The in-depth modules have a part with classical lecture (by the teacher or by a guest lecturer) and a part for expert advice related to the project.

Teaching methods + Study load

There is a commissioning party from outside the university (a client), and students play their own role (consultant in their own discipline). Students are coached on the process (2 coaches) and on subject content (one contact person per discipline).

Systems engineering and multidisciplinary design methods are common themes that run throughout all subjects.

Three modules are given at the level of introductory courses:

- Smart Design
- Building Systems
- Sustainable Exploitation

Specialization in each discipline is offered through the in-depth modules of the second semester phase.

The basic modules make use of blended learning. Part of the content is to be learned and assessed via short assignments digitally previous the lecture. The in-depth modules have a part with classical lecture (by the teacher or by a guest lecturer) and a part for expert advice related to the project.

Contact Hours

Total study-load: 40 hours per week

- Lectures/tutorials: 9 hours a week
- Project workshops, incl. excursions: 8 hours a week
- Coaching: 4 hours a week
- Group meetings / self-study: 19 hours per week

It is a full time minor where presence to all classes, workshops and group work is compulsory.

Subject themes

- Technology and Design
- Management and Organisation

Contact

T. B. Salcedo Rahola
+31 15 260 6312
t.b.salcedorahola@hhs.nl
www.sustainableurbanengineering.nl

Sustainable Urban Energy

<table>
<thead>
<tr>
<th>Level</th>
<th>Undergraduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>2 x 10 weeks</td>
</tr>
<tr>
<td>Language</td>
<td>English</td>
</tr>
<tr>
<td>Study credits (ECTS)</td>
<td>30</td>
</tr>
<tr>
<td>Location</td>
<td>The Hague and Delft</td>
</tr>
<tr>
<td>Osiris code</td>
<td>W-HMVT17-SUE</td>
</tr>
</tbody>
</table>
PACKAGING DESIGN & INNOVATION + SUSTAINABLE PACKAGING DESIGN & INNOVATION

Content

Packaging Design & Innovation
This minor has been developed within the programme Industrial Product Design for the specialization Packaging Design. The minor is intended as an introduction to the field of packaging and packaging design. The overall objective of this minor is to get acquainted with the process of designing packaging. The student combines creativity, knowledge of production, design, ergonomics and marketing. The student is introduced in a relatively short time to know another area of expertise.

Sustainable Packaging Design & Innovation
Subject of this minor is redesign of an existing packaging concept centered around sustainability as explained in the text above. The actual assignment, the design project, will be formulated in cooperation with a company. Examples of design projects are industrial packaging, consumer packaging or last-minute-packaging (packaging which is applied at the very last moment of sale).

Research skills are being trained by so-called student lectures. Students prepare these lectures by doing research about a selected theme and writing a detailed report.

How to reduce food waste?

Our vision is to create a package design which will reduce food waste at consumer level.

The problems:
- Cooking too much
- Buying in large quantities
- Storing in an improper way
- Rice to ratio

The idea behind:
- Adapting to consumers
- Better to store
- Rice to ratio

Pro’s:
- No food spilled with opening the package
- Not cooking to much rice anymore
- Resealable

The design stands out in comparison to other packages due to its shape.

Eventually the students present the outcome in a lecture to be concluded by a question and debating round. Examples of selected themes are environmental management systems, recycling, sustainability, biomimicry, ecodesign, globalization, corporate social responsibility (CSR), CSR of small and medium enterprises and CSR of emerging economies.

Objectives

Packaging Design & Innovation
The goal is not only to gain knowledge about the complexity of packaging design but also to work on relevant skills, such as doing research, presentations (oral and written), designs, generating ideas, different alternatives and assess the suitability of solutions.

Sustainable Packaging Design & Innovation
Sustainable Packaging stands for the integration of environmental aspects in the design of a product/package combinations. This means that, in addition to marketing, economic and technical criteria also take into account environmental criteria. Sustainable packaging improves the quality perception of products, leads to cost savings, helps to meet legislation and provides environmental benefits. In this minor attention is given to developments in the field of sustainability in relation to packaging development. Sustainability should be understood in most broad sense: both technically and economically.
Entry requirements

Packaging Design & Innovation
Student must have completed their first year.

Sustainable Packaging Design & Innovation
The minor Packaging Design & Innovation (PDI) has to be successfully completed.

Teaching methods + Study load

Design Education: 32 hours
Lectures: 48 hours
Company visits / excursions: 16 hours
Self-tuition: 228 hours
Resit (if applicable): 76 hours

Contact Hours
15 contact hours per week

| Packaging Design & innovation + Sustainable Packaging Design & Innovation |
|-----------------------------|-----------------------------|
| Level                       | Undergraduate               |
| Length                      | 2 x 10 weeks                |
| Language                    | English                     |
| Study credits (ECTS)        | 30                          |
| Location                    | The Hague                   |
| Osiris code                 | IPO-HMVT16-PDI              |
|                             | IPO-HMVT16-SPDI             |

Subject themes

- Economy & Business
- Management & Organisation (UK spelling)
- Technology & Design

Contact

W.H. Colenbrander
+31 70 445 8962
W.H.Colenbrander@hhs.nl

G.J. de Koning
+31 70 445 8952
G.J.deKoning@hhs.nl
EMBEDDED SYSTEMS PART 1 & 2

Content

Today Embedded Systems are found in many devices and are used in a large variety of instruments and applications. Most users do not know that their device contains an embedded system. Examples of applications are washing machines, telephones, heating devices, automobiles, consumer devices, medical appliances, measuring devices, internet connected devices (IoT)... By following the minor Embedded Systems part 1 and part 2, the student will learn to design state-of-the-art microcontroller systems and will thereafter be able to apply this knowledge to realize prototypes using professional and modern tools and components.

Objectives

More specifically, the student will learn how to:

- Work with different microcontroller architectures (part 1)
- Convert customer requirements into hardware and software specifications (part 1)
- Create hardware design requirements (part 1)
- Examine and evaluate results from scientific literature and develop software on different development platforms (part 1 & part 2)
- Apply this information in the project work (part 1 & part 2)
- Carry out an engineering project using applicable group skills and project management skills (part 1 & part 2)
- Design, implement and test algorithms and optimize their performance (part 1 & part 2)
- Design software with ‘state of the art’ tools using open-source and commercial tool-chains (part 2)
- Specifically design and evaluate algorithms to implement complex behavior using data from different sensors (part 2)
- Design vision-systems and process images (part 2)
- Perform tests and verifications to guarantee the quality of the design and the realized product (part 2)

Entry requirements

To start with this minor the student should have relevant experience in the following fields:

- Programming skills: basic experience in writing programs for a compiler or interpreter language, such as C, C++, Python, Pascal or Matlab
- Mathematics: Matrix vector processing, solving sets of linear equations
- Basics of control engineering: transfer functions, block schemes, system responses
- Project management: experience with working in project groups, writing a plan of approach, parallel planning, goal oriented working
- Basic skills in digital electronics, reading and drawing schematics
- Experience with real-time systems and/or data-communication is an advantage.

Teaching methods + Study load

Course 1 (study load corresponds to 3 ECTS): each week one lecture of 90 minutes, accompanied by homework and independent learning of approximately 4 hours.

Workshop 1 (study load corresponds to 2 ECTS): each week one practical lab session of 90 minutes Students are required to prepare these sessions adequately.

Course 2 (study load corresponds to 3 ECTS): each week one lecture of 90 minutes, accompanied by homework and independent learning of approximately 4 hours.

Workshop 2 (study load corresponds to 2 ECTS): each week one practical lab session of 90 minutes Students are required to prepare these sessions adequately.

Project organization (study load corresponds to 5 ECTS): at least one meeting per week with project-coach. Students are supposed to work out the project assignment within their group independently. Size of the group will be 4 to 6 students. Students have to follow additional guest lectures and/or tutorials of 90 minutes if required.
Contact Hours

The minimal number of contact hours per week is 8 clock hours.

Subject themes

- Technology and Design
- Software (Programming)
- Hardware

Contact

W. Muhammad
+31 15 260 6278
W.Muhammad@hhs.nl

Embedded Systems Part 1 & 2

<table>
<thead>
<tr>
<th>Level</th>
<th>Undergraduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>2 x 10 weeks</td>
</tr>
<tr>
<td>Language</td>
<td>English</td>
</tr>
<tr>
<td>Study credits (ECTS)</td>
<td>30</td>
</tr>
<tr>
<td>Location</td>
<td>Delft</td>
</tr>
<tr>
<td>Osiris code</td>
<td>E-HMVT16-ES1 E-HMVT16-ES2</td>
</tr>
</tbody>
</table>
ROBOTICS AND VISION DESIGN PART 1 & 2

Content

Today robots are being applied in many fields, from industrial automation and defense to agriculture, health care and assistance of handicapped persons. By following the minor Robotics and Vision Design, you will learn the state-of-the-art of robotics and vision techniques and you will learn to apply this knowledge to design and realize an intelligent robot prototype using commercial-off-the-shelf (COTS) equipment.

Objectives

More specifically, you will learn how to:

• model the kinematics and simulate (arm-type and mobile) robotic systems;
• design a robot controller and implement it on a platform such as ROS, the Robot Operating System;
• translate control tasks into optimization problems and how to solve these with a computer program;
• design a vision system (optics and image capturing) for robotic systems;
• apply various image processing techniques to extract relevant features;
• design and evaluate learning algorithms to learn complex behavior using data from different types of sensors;
• analyze design problems of an external stakeholder in which intelligent robots will be used;
• investigate and evaluate results from (scientific) literature and exploit these for the purpose of the project;
• design, implement, test and integrate robotic and vision subsystems to realize an intelligent robot product for an external stakeholder;
• guarantee the quality of the design and the realized product by performing a rigorous requirements analysis and verification.
Entry requirements

Prerequisites for this minor are mastering the following subjects:

- Matrix calculus: matrix vector multiplication, solving set of linear equations;
- Dynamics: speed, acceleration, free body diagrams and equation of motion;
- Basics of control engineering: transfer functions, block schemes, system responses;
- Introduction in programming: some experience with writing of programs in a compiler or interpreter language, such as C, C++, Python or Matlab;
- Experience with design projects: knowledge of the V-model, functional decomposition, experience with working in project groups, writing a plan of approach, parallel planning, goal oriented working.

Teaching methods + Study load

Courses and educational organization:

- Robot control (study load corresponds to 3ECTS):
  - each week one lecture of 90 minutes
  - each week one practical of 90 minutes
- Pattern recognition (study load corresponds to 3ECTS):
  - each week one lecture of 90 minutes
  - each week one practical of 90 minutes
- Machine learning (study load corresponds to 3ECTS):
  - each week one lecture of 90 minutes
  - each week one practical of 90 minutes

Project organization (study load corresponds to 6ECTS):

- Weekly meetings with project coach
- 3 guest lectures, each of 90 minutes
- 3 tutorials, each of 90 minutes

Contact

dr. ir. P.R. Fraanje
+31 15 260 6362
P.R.Fraanje@hhs.nl

ing. Theo Koreneef
+31 15 260 6304
T.J.Koreneef@hhs.nl

Subject theme

Technology and Design

Robotics and Vision Design Part 1 & 2

<table>
<thead>
<tr>
<th>Level</th>
<th>Undergraduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>2 x 10 weeks</td>
</tr>
<tr>
<td>Language</td>
<td>English</td>
</tr>
<tr>
<td>Study credits (ECTS)</td>
<td>30</td>
</tr>
<tr>
<td>Location</td>
<td>Delft</td>
</tr>
<tr>
<td>Osiris code</td>
<td>ME-HMVT19-RVD</td>
</tr>
</tbody>
</table>
ASSISTIVE DEVICES

Content

Societal changes ask for (prolonged) self-reliance of people, both for their functioning in a working environment, as well as at home. Furthermore, nowadays employers are responsible for sustainable employment of their employees. Assistive devices can support and train people in their tasks in order to increase their self-reliance and their employment. Examples of such devices are exoskeletons but also (haptic) training devices. The minor focusses not only on developing an assistive device, but also on evaluating its functionality and performance.

Objectives

More specifically, you will learn how to:

• Analyse a situation of the target group for which the device will be developed and translate this into requirements and specifications for the device
• Analyse dynamics of human movements through simulation
• Distinguish between different control methods, such as haptic control methods, and their specifications and choosing the most suitable one for the human-device combination
• Select the appropriate sensor and actuator system for the assistive device
• Develop a concept and detail design of an assistive device
• Being able to minimize the mass of the assistive device
• Design a user friendly interface, taking into account the activities and possible disabilities of the person
• Develop and test the functioning and performance of the assistive device
• Implement the controller and tune it to obtain the desired response
• Setting up a research plan and using it to systematically evaluate the use and performance of the device
Entry requirements
To start with this minor you should have mastered the following subjects:

- Matrix calculus: matrix vector multiplication, solving set of linear equations;
- Dynamics: speed, acceleration, free body diagrams and equation of motion;
- Basics of control engineering: transfer functions, block schemes, system responses;
- Introduction in programming: some experience with writing of programs in a compiler or interpreter language, such as C, C++, Python or Matlab;
- Construction: analyzing of forces and stresses on and within a construction;
- Project management: experience with working in project groups, writing a plan of approach, parallel planning, goal oriented working.

In addition, you should have completed the propae-deutic exam and obtained at least 60 ECTS of the main phase (hoofd fase) of your study.

Contact Hours
The minimal number of guided contact hours (lectures and project guidance) per week is: 6 hours (these are clock hours).

Subject theme
Technology and Design

<table>
<thead>
<tr>
<th>Asisstive Devices</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>Length</td>
<td>2 x 10 weeks</td>
</tr>
<tr>
<td>Language</td>
<td>English</td>
</tr>
<tr>
<td>Study credits (ECTS)</td>
<td>30</td>
</tr>
<tr>
<td>Location</td>
<td>Delft</td>
</tr>
<tr>
<td>Osiris code</td>
<td>ME-HMVT18-AD</td>
</tr>
</tbody>
</table>

Teaching methods + Study load
In period 3 the following classes are scheduled:

- Biomechanics (study load corresponds to 84 study hours):
  - each week 2 lectures of 45 minutes
  - each week one practical op 90 minutes
- Sensors and actuators (study load corresponds to 84 study hours):
  - each week 2 lectures of 45 minutes
  - each week one practical op 90 minutes
- Control methods (study load corresponds to 84 study hours):
  - each week 2 lectures of 45 minutes
  - each week one practical op 90 minutes

In period 4 the following classes are scheduled:

- Construction and FEM (study load corresponds to 84 hours): each week 2 lectures of 45 minutes
- Human machine interaction (study load corresponds to 84 hours): each week 2 lectures of 45 minutes
- Research and test methods (study load corresponds to 84 hours): each week 2 lectures of 45 minutes

Contact
A. Le Mair
+31 15 260 6251
A.leMair@hhs.nl
ENERGY TRANSITION

Due to earthquakes in Groningen, getting rid of fossil fuels because of climate change, and not being dependent on foreign countries, the Netherlands wants to not use gas anymore in 2050. Decoupling neighbourhoods from gas is therefore a very urgent topic at the moment. But how? And who is going to pay for it? The main objective of this minor is to develop a sustainable roadmap for a neighbourhood, aiming at the years 2030-2040.

This minor consists of a project (equivalent 6 ECTS) for a real client (a municipality and a consultancy). The project is supported by Skills (equivalent 3 ECTS). Next to the project, you will get courses on Energy Transition, Mobility management and Transition Management (equivalent 3x2 ECTS).

Objectives
The main objective of this minor is to develop a roadmap for the municipality of The Hague. Aiming at a gas-free neighborhood in 2040.

Entry requirements
Students must be 3rd or 4th year students in order to participate in this minor. Accessible to students with a basic background on physics and maths.

Teaching methods + Study load
The project consists of lectures, guest lectures, round table discussions, group and individual assignments, student presentations, case-study research and excursion(s). The courses usually take 7 lectures and an exam each.

Contact Hours
Average per week:
- Lectures: 12 hours
- Workshops: 3 hours
- Coaching: 1.5 hours
- Project: 20 hours

Subject themes
- Economy and markets
- Management & organization
- Technology and design
- Policy

Contact
S. Brinkman
+31 70 445 8713
s.brinkman@hhs.nl

Sustainable Urban Energy
<table>
<thead>
<tr>
<th>Level</th>
<th>Undergraduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>10 weeks</td>
</tr>
<tr>
<td>Language</td>
<td>English</td>
</tr>
<tr>
<td>Study credits (ECTS)</td>
<td>15</td>
</tr>
<tr>
<td>Location</td>
<td>The Hague</td>
</tr>
<tr>
<td>Osiris code</td>
<td>RO-HMVT17-ET</td>
</tr>
</tbody>
</table>

REGULAR MINOR

Content

Teaching methods + Study load

Contact Hours

Subject themes

Contact

Sustainable Urban Energy

Level

Length

Language

Study credits (ECTS)

Location

Osiris code
REGULAR MINOR
CLIMATE CHANGE IN INTERNATIONAL PERSPECTIVE

Content
The Netherlands has a strong urban development sector. But how does it work abroad?

Different culture, different laws, different geology, different climate. That demands a whole different approach.

You will get an urban development case in a foreign country.

Objectives
This term is about the impact of climate change worldwide. You will approach the issue from an urban development perspective and from different angles: cultural background, local climate adaptation, politics and finance.

Intercultural sensitivity and globalization do get extra attention.

On top, you will get courses on globalisation climate change and international environmental law, each 2 ECTS. The project is 9 ECTS.

Entry requirements
Students must be 3rd or 4th year students in order to participate in this minor.

Teaching methods + Study load
The successful completion of this minor is equivalent to 15 ECTS.

Contact Hours
About 20 hours per week

Contact
S. Brinkman
+31 70 445 8713
s.brinkman@hhs.nl

Climate Change in International Perspective

<table>
<thead>
<tr>
<th>Level</th>
<th>Undergraduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>10 weeks</td>
</tr>
<tr>
<td>Language</td>
<td>English</td>
</tr>
<tr>
<td>Study credits (ECTS)</td>
<td>15</td>
</tr>
<tr>
<td>Location</td>
<td>The Hague</td>
</tr>
<tr>
<td>Osiris code</td>
<td>RO-HMVT17-CCIP</td>
</tr>
</tbody>
</table>
THE MANY FACES OF GLOBALIZATION

Content

The goal of this minor is to provide an introduction to the many aspects and dimensions of globalization. The daily challenges faced today by a wide array of professionals are not entirely local or national, but are also connected to developments occurring in Europe and in the rest of the world. In the context of higher professional education, this means that future professionals are becoming critical world citizens. You will get about 20 guest lectures on all angles of globalization, like refugees, climate change, transport, social media and politics. A course on globalization is being offered, as well as workshops on intercultural sensitivity.

Objectives

The goal of this minor is to provide an introduction to the many aspects and dimensions of globalization. The daily challenges faced today by a wide array of professionals are not entirely local or national, but are also connected to developments occurring in Europe and in the rest of the world.

In the context of higher professional education, this means that future professionals are becoming critical world citizens. In order to become a critical world citizen, it is necessary to acquire specific knowledge, competences and skills.

At the end of this minor:

- The student is able to analyze and distinguish issues regarding globalization
- The student is able to use the differences between the students while working together
- The student is able to formulate a substantiated opinion on issues regarding globalization

Teaching methods + Study load

The successful completion of this minor is equivalent to 15 ECTS. Each week:

- Guest lectures: 8 hours
- Seminar: 2 hours
- Coaching: 2 hours
- Movie: 4 hours
- Course on globalisation: 2 hours
- Working on case study: 15 hours
- Preparation on course and seminar: 3 hours

There will be one or two excursions as well during the period.

Contact Hours

Approx. 20 hours per week

Subject theme

International

Contact

S. Brinkman
+31 70 445 8713
s.brinkman@hhs.nl

The Many Faces of Globalization

<table>
<thead>
<tr>
<th>Level</th>
<th>Undergraduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>10 weeks</td>
</tr>
<tr>
<td>Language</td>
<td>English</td>
</tr>
<tr>
<td>Study credits (ECTS)</td>
<td>15</td>
</tr>
<tr>
<td>Location</td>
<td>The Hague</td>
</tr>
<tr>
<td>Osiris code</td>
<td>CLE-HMVT14-GLO</td>
</tr>
</tbody>
</table>
REGULAR MINOR
BE SMART: STRATEGIES FOR SMART SUSTAINABLE CITIES

Content
Challenges:
• The challenge of sustainable development: population and consumption growth exceeding the planetary limits.
  - Local and global
  - Technology, the culprit?
  - Pollution, consumption and equity
  - Global equity and world order
• Climate Change mitigation
• Climate Change adaptation
• Eco Systems, Pollution, emissions, waste and waste water
• Resource scarcity, recycling, circular material flows
• Urban health challenges in the built environment: clean air, noise, clean water, green areas, urban heat

Objectives
• Obtain knowledge regarding the challenges that the Sustainable Development Goals pose to urban development
• Learning analysis, design and intervention methods to stimulate and manage urban transitions

Apply these methods in a hands on project regarding an urban area transition or niche experiment, deal with stakeholders and report results (written and orally).

Teaching methods + Study load
Part I and II will be taught by lectures, followed by tutorials and exercises.

Larger exercises will take place regarding geo-information systems and the use of open data.

Excursions and site visits will be important to obtain first-hand knowledge and meet stakeholders.

Contact Hours
• Term 1: 10 hours of lectures/tutorials, 8 hours of supervised exercises
• Term 2: 4 hours of general progress meeting, 8 hours of group supervision

Subject theme
International & Technology and Design

Contact
C. Verweij
+31 70 445 8971
C.Verweij@hhs.nl

Karel Mulder
+31 6 29053564
K.F.Mulder@hhs.nl

Strategies for Sustainable Cities

<table>
<thead>
<tr>
<th>Level</th>
<th>Undergraduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>2 X 10 weeks</td>
</tr>
<tr>
<td>Language</td>
<td>English</td>
</tr>
<tr>
<td>Study credits (ECTS)</td>
<td>30</td>
</tr>
<tr>
<td>Location</td>
<td>The Hague</td>
</tr>
<tr>
<td>Osiris code</td>
<td>B-HMVT18-BES</td>
</tr>
</tbody>
</table>
PROTOTYPING & CRAFTSMANSHIP

Content
The Prototyping and Craftsmanship course is part of the program of IDE/Open Innovator. During this course you will learn methods and techniques that will help you in the process of making design decisions concerning materials, prototyping methods to measure results, iteration and evaluation. Throughout a series of craft-oriented design projects, in this course you will put into practice the connections between material, ‘muscle memory’ and the use of tools to develop design skills. Exercises on quality, precision and personal expression will challenge your ideas and encourage interesting discussions about what constitutes ‘good work’ within the design practice. Students work with assignments from different clients, for example, retail, design or crafts industry.

Objectives
The Prototyping and Craftsmanship course is part of the program of IDE/Open Innovator ‘The Creator’. In this course you will learn methods and techniques that will help you in the process of making design decisions concerning materials, prototyping methods to measure results, iteration and evaluation.

During Module 2.3 of this course you will learn:

- To apply craftsmanship skills and techniques at an advanced beginner level on different assignments to make prototypes by combining different materials
- To make use of design methods, workshop facilities and tools efficiently
- To apply design process methods to accomplish personal expression in all assignments
- To reflect on the design decisions that are being made on the production of models and prototypes and to document these key decisions in your portfolio
- To optimize time and materials to accomplish the production of models and prototypes at an advanced beginner level

Entry requirements
You should have completed the propaedeutic exam and obtained at least 60 ECTS of the main phase of your study.

Teaching methods + Study load
Study load is based on 30 ECTS. Courses and educational organization. Content:

- Unit 1(Back to the future) - Assignments to practice prototyping skills
- Unit 2 (The Craft of Designing) How to use craftsmanship in the design practice.
- Unit 3(Craft is in the details)– Practicing quality in execution.
- Week 18 retake

Teaching methods:
- Project work
- Lectures
- Workshops
- Studio/workshop work
- Excursions

Contact Hours
The minimal number of contact hours per week is 12 hours, for 12 weeks.

Subject themes
- Craftsmanship
- Prototyping and Design

Contact
B.G. Bustamante Castillo
B.G.BustamanteCastillo@hhs.nl

S. Kabbes
S.Kabbes@hhs.nl

Prototyping and Craftsmanship

<table>
<thead>
<tr>
<th>Level</th>
<th>Undergraduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>2 x10 weeks</td>
</tr>
<tr>
<td>Language</td>
<td>English</td>
</tr>
<tr>
<td>Study credits (ECTS)</td>
<td>30</td>
</tr>
<tr>
<td>Location</td>
<td>The Hague</td>
</tr>
<tr>
<td>Osiris code</td>
<td>IDE-HMVT18-PRCR</td>
</tr>
</tbody>
</table>

For this design minor, a major in design is required!
DESIGN MINOR
DESIGN WITH NATURE

Content
Nature is probably world’s most effective designer, having solved many big and small challenges in the course of evolution and adaptation.

In this semester students learn to create new solutions by taking inspiration from nature (biomimicry) and/or by letting nature be part of the solution itself (bio design and bio-hacking).

This minor will enable students from different backgrounds to work within interdisciplinary teams of designers, scientists and engineers.

Understanding and applying the basics of life sciences, working with nature inspired design methods and learning how to create your own open source lab tools to conduct hands-on experiments are at the center of attention.

Objectives
The general objective of the minor is to train students to create solutions for a wide range of challenges and to design products by taking inspiration from nature and/or by involving nature in the design of the product. This minor will enable students from different backgrounds to work within interdisciplinary teams of designers, scientists and engineers.

Entry requirements
Students should submit a Letter of Motivation (500 words in English) that explains their interest in the field of design with nature, what they would like to learn and achieve by taking this minor. Letter of Motivation should be sent to s.zehtabchi@hhs.nl or m.l.cuypers-henderson@hhs.nl at the time of online enrolment. The applicants will be informed about the result of their application within 10 working days after the submission of the letter.

Teaching methods + Study load
The course includes weekly lectures and hands-on workshops on diverse topics that support the project which is conducted by students who work in multidisciplinary groups.

Contact Hours
This minor requires 40 hours work per week:
• 14 contact hours p/w (tutoring/workshops/excursions)
• 26 hours p/w self-study and teamwork

Contact
S. Zehtabchi
+31 70 445 8956
s.zehtabchi@hhs.nl

Design with Nature

<table>
<thead>
<tr>
<th>Level</th>
<th>Undergraduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>2 x 10 weeks</td>
</tr>
<tr>
<td>Language</td>
<td>English</td>
</tr>
<tr>
<td>Study credits (ECTS)</td>
<td>30</td>
</tr>
<tr>
<td>Location</td>
<td>The Hague</td>
</tr>
<tr>
<td>Osiris code</td>
<td>IDE-HMVT18-DWN</td>
</tr>
</tbody>
</table>

For this design minor, a major in design is required!
DESIGN MINORS

These minors belong to the study programme of Industrial Design Engineering. All minors have a length of 2 x 10 weeks (30 ECTS). Please contact Mr. Marcel van Geffen when interested. You can send your email to m.vangeffen-1@hhs.nl. For these design minors, a major in design is required!

ECONOMICS OF MASS

This semester contains the nuances, understanding and methods to design products in large quantities. Next to designing for mass manufacturing it also puts design in the context of new advances in manufacturing and scarcity of materials.

ENTREPRENEURSHIP

You have an idea for an innovative product to put on the market. In this semester you’ll get started with your business plan, and plan the launch of your product.

EXPLORING NEW TECHNOLOGIES

How does technology impact our individual experiences or our physical and social environment? This is the semester in which you explore new concepts and technologies to understand the opportunities and benefits of technological advances. Such explorative approach is essential for designers who are keen to embrace emerging technologies as tools for increasing the quality of life.

PRODUCT ENGINEERING

In PE you focus on the technical aspects of designing products. You build on what you have learned in unit 2 of Boi and increase your knowledge on production techniques, calculating product measurements, and making smart and innovative material choices. You will go beyond the basics of working with 3D software.

RESPONSIBLE DESIGN

RD is the semester for you if you want to make sure the products and innovations you think up as a designer are in line with the 5 P’s: People, Planet, Prosperity, Peace, and Partnership. You will go indepth into what they mean for a designer. You will develop an ethically sound way of working, contributing to the sustainable development of our society with as much impact as possible.
SMART OBJECTS

With the internet of things emerging all around us, products more and more often contain smart technology. In this semester you will focus on designing these smart objects. You look at the interaction design of a product and how users can deal with the complexity and newness of it. Also you dive into the different technological solutions which continue to emerge rapidly.

SERVICE DESIGN

You will learn how design methods are relevant in designing intangible experiences such as a service. You will do creative user research; Facilitate workshops with different stakeholders, such as users and service providers. You will prototype and iterate a service experience. You will learn how the new service impacts the organisation.

You will get know an organisation and service providers, through stakeholder analysis and value flow modelling (business), applying creative methods to do user research, such as diaries, and customer journey mapping (research and methods and techniques). You will prototype and iterate a new service and test the user experience, with a service design blue print and theatrical tools (user& behaviour and visualisation).
STUDYING IN THE NETHERLANDS

There are many good reasons to study in The Netherlands. Dutch education is one of the most innovative and forward thinking systems in the world. It’s based on student-led learning, debate and hands-on experience.

The Netherlands also offers a high standard of living at a fairly low cost. Dutch society is liberal and open-minded with a vibrant cultural scene. You’ll be part of a dynamic cosmopolitan and multi-cultural community right in the heart of Europe.

It is a small country with a big international presence and is the 21st largest economy in the world. Some of the world’s biggest multinationals, including Philips, Heineken, KLM, Shell, ING Bank and Unilever are Dutch. Sony, Sara Lee and Microsoft all have their European HQs here.

The Netherlands has two main types of higher education institutions - research universities and universities of applied sciences. Research universities are mainly responsible for offering research oriented programmes, while universities of applied sciences offer programmes which focus on the practical application of arts and sciences.

CAMPUS LIFE

THUAS has campuses in The Hague, Zoetermeer and Delft. You’ll find the Faculty of Technology, Innovation and Society in both The Hague and Delft.

The main campus in The Hague is centrally located close to parliament and world famous international organisations like the International Criminal Court.

Since the Delft campus opened in 2009, it has earned itself an excellent reputation in higher technical education and now offers eight degree programmes - Applied Mathematics, Electrical and Electronic Engineering, Engineering Project Leader associate degree, Industrial Engineering and Management, Computer Science, Engineering Physics, Mechanical Engineering and Mechatronics.

Delft is a high-tech and scientific hub with research centres and environmental technology companies - the perfect place to nurture your skills. Companies cluster in the Clean Tech Delta and Medical Delta. The Technological Innovation Campus is a hotbed for environmental research into sustainable energy sources and biofuels and cancer treatments. We work with institutions like TNO, Deltares, UNESCO-IHE, DSM and Exact.

MORE INFORMATION?

Please also check the website for information:
www.thehagueuniversity.com/programmes/other-courses/exchange-programmes/what-can-i-study

Do you want to apply?
https://www.thehagueuniversity.com/programmes/other-courses/exchange-programmes/practical-information
CAMPUS THE HAGUE (MAIN CAMPUS)
Johanna Westerdijkplein 75
2521 EN Den Haag

thehagueuniversity.com
tis-international@hhs.nl

CAMPUS DELFT
Rotterdamseweg 137
2628 AL Delft