NOTE:
Some course codes in this guide are incorrect.
At the end of this guide you will find a form with the updated codes.
For (more) up to date information on course codes, please go to:
- Osiris: osiris.utwente.nl
- Timetables: www.utwente.nl/roosters
Study guide for Creative Technology 2010/2011

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CREATIVE TECHNOLOGY
1.1 Aims and objectives of the CreaTe programme

There is a fading boundary between the natural physical world and the world of (interactive, intelligent, understanding) artefacts. Creative Technology strives for designers who are fluent speakers of the languages of both worlds, and who can unite the two. We educate designers in a community of students with different backgrounds, and with different interests and motivation. These designers will be valuable in application areas of any kind.

The design goals of Creative Technology are similar to goals in Industrial Design, with one major difference: CreaTe concentrates on “design for the digital world” (game design, web design, interaction design, motion design and motion graphic design, and visual communication).

The engineering goals of Creative Technology cover aspects of Computer Science and Electrical Engineering (programming, web technology, sensors, communicating systems, dynamical systems and system control).

Obviously, Creative Technology aims at applications in Creative Industry and entertainment.

But learning, training and persuasion through serious games are equally important. And so is enhancing reality for various purposes, e.g. to stage interaction while participants are at different locations, to create distraction, to create a feeling of well-being, to improve perception, or to improve safety and security. One finds ideas and concepts for enhanced reality in interior design, in architecture, in public space, in health care and in many other areas.

As a Creative Technology graduate you qualify as a designer in the sense of Herbert Simon. Simon defines design as “a way to improve situations”. He argues that a designer needs not only rational and analytical ways of thinking, but also “design thinking”, where emotional and cultural aspects become important. Design thinking often comes up in the context of “experience design.” Experience design is primarily a way of looking at design. It is the practice of designing products, processes, services, events, and environments with a focus placed on the quality of the user experience and culturally relevant solutions. Less emphasis is placed on increasing and improving functionality of the design. Creative Technology is a university programme with ample attention for design thinking and experience design.

New developments in engineering often concern the more clever exploitation of the laws of nature. The imagination of the engineers concentrates on better understanding and manipulation of their “materials”. They need advanced science.

Another type of engineering innovation is the introduction of artefacts (not necessarily advanced in their construction) for new and sometimes unexpected purposes. The fantasy of the engineers concentrates on making life safer, healthier, easier, more exciting or just more fun. They need science, but also understanding of human behaviour, and affinity with the creation of visual (and other) experience.

Creative Technology aims at graduates of the second type.

1.2 The final qualifications

The intended learning outcomes of the Creative Technology curriculum are captured by the following 12 final qualifications for the Creative Technology graduates.

1. Graduates are skilled in problem-finding, idea and concept generation, and in the identification of opportunities for the exploitation of new technology; they can develop concepts and ideas, using the latest tools, into key prototypes. (Concept generation and prototype development)

2. Graduates can evaluate concepts and ideas from the viewpoints of functionality, performance, experience, user acceptance and usability, marketing and societal implications (issues like privacy and security); they can present the results of their evaluation in an understandable manner. (Evaluation of concepts)

3. Graduates understand the workflow of a design process, can plan such a design process, and are aware of the effects that unforeseen circumstances (new ideas, new requirements, lack of resources) may have on this planning. (Understanding and planning the design process)

4. Graduates can assume a role in a multi-disciplinary team, are aware of personal strengths and weaknesses, can develop a personal vision and can capture requirements and knowledge from different fields of specialization. (Collaboration and multidisciplinarity)
5. Graduates know the relevant theories underpinning graphic design in all its aspects (including the use of colour and motion, the combination of text and other visual means, and even the combination of graphics and sound) (Skills and knowledge in graphic design)

6. Graduates know the relevant (web technology, databases, dynamic and control systems) technologies to be used, and the relationships they have to one another and to graphic and motion design (qualification 5), concerning both principles and functionality. In addition to this, each student has additional technological knowledge, which concerns, depending on his specialization, either knowledge of (serious) games and 3D (virtual) environments or knowledge of sensors, wireless communication and electronics. (Knowledge of technology)

7. Graduates can implement algorithms and combine principles from physics and mathematics at the level required to demonstrate an application. (Skills in technology)

8. Graduates can analyze and classify system behaviour and express the analysis in mathematical models; they can use tools to perform simulations, they are capable of critical evaluation of their simulations. (Skills and knowledge in modelling and simulation)

9. Graduates know how to develop a business plan. (Business knowledge)

10. Graduates are aware of the roles of designers in society, and the standards (ethically and legally) for professional behaviour. (Roles in society)

11. Graduates can communicate with experts and non-experts about all aspects of his field, i.e. firstly concerning concepts, ideas, opportunities, and design workflow (qualifications 1, 3), secondly concerning evaluation of concepts (qualification 2), and finally concerning prototype development and technological and modelling issues (1, 6, 7, 8); this communication covers presentation, justification and documentation, and (to a limited extent) scientific debate; in this communication the graduate knows how to employ modern media. (Communication)

12. Graduates are capable of logical reasoning; they are inquisitive and capable of posing proper questions; they can critically evaluate results obtained (by themselves and others); they are capable of critical reflection and can adapt their behaviour on the basis of that reflection, and are aware of gaps in their own knowledge and skills; they are prepared to learn and capable of learning. (Basic academic attitude)
2.1 Characteristics of the curriculum

2.1.1 We call it CreaTe

Staff and students use the name CreaTe to refer to the Creative Technology curriculum.

2.1.2 Curriculum construction

The curriculum structure is a “story” which is designed to reflect the intended learning outcomes. The main storyline is about design for the digital world in all of its aspects (idea and concept generation, evaluation of concepts, business skills, and professional conduct).

This storyline is embodied in the five CA-units (CA for Creative Applications, 32 EC), three in the first year, totalling 15 credits, and two in the second year, totalling 17 credits.

The design themes vary from unit to unit. The theme is primarily experience design (Have fun and play, Hybrid worlds and Living and working tomorrow). Communication design is a second theme (Ambient screens). The third theme, product design is addressed both in Living and working tomorrow and in Hybrid worlds. Each Creative Applications unit offers challenges, to produce viable solutions for real world applications, in projects with an intrinsic element of public exposure. Applications relate to existing research domains of the university at large, i.e. health, media, communication and business.

The five CA units are supported by two small CE-units (CE for Creative Explorations, 4 EC), one in each year, each unit 2 credits, are devoted to the interplay between technology and arts. In the Creative Explorations (CE) students are involved in explorative activities. They provide historical context and enrichment coming from visits to exhibitions or by participating in small-scale projects such as making an installation initiated by an invited artist in residence.

In the story told by the CA and CE units six important “characters” appear. They are Design, Business, Smart Technology, New Media, Computer Science and Mathematics.

In the course of the story, we get to know these characters better and better (from the viewpoint of their role in the story). For this purpose there are (often smaller) units of study.

---

2 Storytelling (or stageing) is a metaphor which is often encountered in discussions about experience design and experience economy. This somewhat unusual presentation of the curriculum structure in terms of a storyline and its characters is an example of “practice what you preach.”
These units are either disciplinary courses or project based courses. The disciplinary courses have a traditional approach, with regular courses and assignments. They are the courses with a strong focus on abstractions, models, specifications and analysis of processes. Simulation is a major tool, and the underlying models, methodology and mathematical language are taught. The project-based courses support active, ‘learning by doing’ participation of students.

The seven DE-units (DE for Design, 15 EC), four in the first year, totalling 9 credits, and three in the second year, totalling 6 credits, are devoted to design knowledge and skills.

The two BI-units (BI for Business, 6EC), both in the second year, totalling 6 credits, develop knowledge about bringing design to market, and about “running a business.”

The six ST-units (ST for Smart Technology, 6+15 EC), two in the first year, totalling 9 credits and four in the second year, totalling 15 credits are devoted to engineering skills and knowledge (and their integration) in the fields of dynamical and control systems, sensors, (wireless) communication systems and electronics. The two ST items of the first year are compulsory for all students. The four ST items of the second year are for the students who specialize in experience, communication and products by “smart technology”.

The five NM units (NM for New Media, 8+15 EC), two in the first year, totalling 8 credits, and three in the second year, totalling 15 credits, are devoted to engineering skills and knowledge in the area of new media, web technology and games. The two NM-items of the first year are compulsory for all students. The three NM-items of the second year are for the students who specialize in experience, communication and products by “new media”.

The four CS-units (CS for Computer Science, 16 EC), two in both years, 8 credits in both years, serve to develop the basic skills and knowledge to understand and build systems of cooperating programmable components. These skills and knowledge support the teaching and learning in the Smart Technology and New Media areas.

The five MA-units (MA for Mathematics, 15 EC), three in the first year, totalling 9 credits and two in the second year, totalling 6 credits, serve to develop knowledge and skills in modelling of (mostly physical) phenomena. They support the teaching and learning in the other areas (also Design and Business).
2.1.3 Prospective students

The admission requirements for Creative Technology are simple: a VWO certificate of any kind (in Dutch: C&M, E&M, N&G, N&T) is adequate.

This entry level is uncommon for Bachelor’s with objectives in ‘disciplinary’ engineering in the Netherlands.

The choice for admission of students of all profiles reflects our interest in teaching design, and not pure science. We intend to educate designers with a cultural interest, who understand and improve our everyday live, by working at the boundaries of the human world and the world of digital artefacts. The diverse intake is an asset for teaching and learning design. Different viewpoints and interests stimulate idea and concept generation.

2.1.4 The language of the CreaTe programme

The Creative Technology curriculum is taught in English.

2.2 The CreaTe programme overview

The CreaTe curriculum is a three year curriculum at Bachelor’s level, with a study load of 180 credits (EC) in total. Each year comprises 60 EC.

One quarter of the first two years is occupied by Creative Applications projects. They constitute the major storyline in the curriculum. Around these applications there are units of study which provide essential knowledge and skills in engineering, design and business, in support of the main storyline.

The first year of the curriculum is identical for all participating students. It consists of 17 mandatory units of study.

One quarter of the second year is devoted to specialization. As a second year student you choose either the Smart Technology, or the New Media subjects to specialize in. For students in the New Media track the second year consists of 15 mandatory units of study. The students in the Smart Technology track take 16 mandatory units in their second year.
2.3 After graduation

2.3.1 Access to Master’s programmes

The Creative Technology graduates have the qualifications that allow access to further programmes at academic Master’s level (WO master).

They have access to the Human Media Interaction (HMI) Master’s programme of the University of Twente, without any restriction.

Moreover, in their “profileringsruimte” of the third year, Creative Technology students can take a half-year course programme, which may serve e.g.

- to prepare for further study in the Master’s programme Communication Studies;
- to prepare for further studies in Industrial Design Engineering;
- to prepare for further studies in Mechatronics or Electrical Engineering.

All students with a Bachelor’s degree in a field of engineering and design have access to the Master’s programme on Philosophy of Science Technology and Society (PSTS) of the University of Twente, and to the Master’s programme Science Education and Communication (SEC, a joint programme of the 3TU federation). This is the university’s admission policy.

Note that the Master’s programmes of the University of Twente are taught in English. But the Science Education specializations in SEC, leading to a Dutch qualification to teach, are in Dutch.
2.3.2 The qualification to teach

The possibilities for Creative Technology students to opt for a so called “educatieve minor” (minor programme for teaching skills) in the “profileringsruimte” (free space to establish a profile) of their third year, and to enter the Computer Science specialization within the SEC master after graduation (in order to become a qualified Computer Science teacher in secondary education), are still under investigation.

2.3.3 Labour market options

The Creative Technology graduates have the option to enter the labour market. To prepare for a role on the labour market, they can use their “profileringsruimte” (free space to establish a profile) to take courses (and projects) of the minor programmes for Ondernemerschap or Management.

The professional field points at three most important competencies for the career of a Creative Technology graduate. They are:

• idea and concept generation;
• evaluation of concept, not just from a technical and functionality viewpoint, but also in terms of user experience and business case;
• broad and reliable technical skills and knowledge in the field of “digital applications”.

The following jobs and job scenario’s are typical for this type of professional, with an academic background at Bachelor’s level. With most of the professional roles there is a specific type of market and industry. These markets are:

• product design -- in healthcare and entertainment;
• communication -- regional/global media campaign;
• entertainment -- new concepts in private and public settings;
• game development -- serious games in education and corporate training.

The roles are:

• In general
  entrepreneur – creating business, creative genius – generating idea(s), content author – to produce material(s), technical developer – to write script(s) & programme(s);
• In product design
  visual designer – to give aesthetic appeal, concept developer – to accommodate human
needs, expert in usability & deployment – making it fit for it’s role, evangelist – to promote
the (benefits of the) idea;

- In communication
  web developer – setting up portal(s), cross media architect – relating all media, production
  agent – to coordinate delivery, strategic planner – defining targets and goals;

- In entertainment
  concept design – defining new artefacts, expert in technical infrastructure – for realization,
  business plan – to coordinate the enterprise, production manager – mediating between
  parties;

- In game development
  theme(s) & storyline(s) – setting the context, style & visual(s) – creating the appeal, asset
  development – to embody the game, interaction & experience design – to promote
  involvement.

2.3.4 Extra curricular activities

2.3.4.1 Honours programme
If you’re looking for more than the usual academic challenges, you may want to apply to the
UT honours programme. The Honours programme is designed for talented, interested and
highly motivated students. In almost one and a half year we offer you a 30 EC programme. The
programme is for first year students from all faculties. You will enjoy a challenging and nurturing
environment, where you receive personal attention from academics with various backgrounds. You
will become acquainted with great scientist and train you research skills. You will get to work on an
individual project where you write a research proposal within your field of study.

2.3.4.2 Mathematics Excellence stream
The Excellence stream is a mathematical programme with a high level of abstraction. It is intended
to deepen your mathematical level. The Excellence stream offers a complete parallel programme for
mathematical courses in your Bachelor’s programme. The best (and motivated) students of various
technical Bachelor programmes (approx. 10%) qualify for the Excellence programme, provided by
the Bachelor Applied Mathematics.
3.1 General observations about the CreaTe curriculum

Units of study of the curriculum are classified in themes (or categories). The categories are:
1. Creative Applications (CA)
2. Creative Explorations (CE)
3. Design (DE)
4. Business (BI)
5. Smart Technology (ST)
6. New Media (NM)
7. Computer Science (CS)
8. Mathematics (MA)

Besides the units of study in these categories, the curriculum has:
• electives;
• free space to establish a profile (“Profileringsruimte”), and a;
• graduation project.

Table 3.1 summarizes the workload in EC over the various categories and years of study.

Note that the second year total in the table is not the 60 EC of the Total’s column. This is due to the fact that each student opts for either the 15 EC in the Smart Technology category, or the 15 EC in the New Media category, but not both. This observation also holds for the final row of the table. No student will take 23 credits in New Media and 24 in Smart Technology. A student takes either 24 ST credits and 8 NM credits, or 9 ST credits and 23 NM credits.

<table>
<thead>
<tr>
<th>Year</th>
<th>CA+CE</th>
<th>DE</th>
<th>BI</th>
<th>ST</th>
<th>NM</th>
<th>CS</th>
<th>MA</th>
<th>EL</th>
<th>PR</th>
<th>GP</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>17</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>19</td>
<td>6</td>
<td>6</td>
<td>15</td>
<td>15</td>
<td>8</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>15</td>
<td>6</td>
<td>24</td>
<td>23</td>
<td>16</td>
<td>15</td>
<td>15</td>
<td>30</td>
<td>15</td>
<td>180</td>
</tr>
</tbody>
</table>

3.1 CREATIVE TECHNOLOGY CURRICULUM UNITS
### 3.2 The CreaTe curriculum in detail

Tables 3.2-3.4 show the units of study of the three years of the CreaTe curriculum.

<table>
<thead>
<tr>
<th>Category</th>
<th>SEMESTER 1</th>
<th>SEMESTER 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>15 EC Creative Applications</strong></td>
<td><em>(3 EC, sem 1)</em> We create identity</td>
<td><em>(6 EC, sem 1-2)</em> Living and working tomorrow</td>
</tr>
<tr>
<td></td>
<td><em>(6 EC, sem 2)</em> Have fun and play</td>
<td></td>
</tr>
<tr>
<td><strong>2 EC Creative Explorations</strong></td>
<td><em>(2 EC, sem 2)</em> Creative exploration of structures</td>
<td></td>
</tr>
<tr>
<td><strong>9 EC Design</strong></td>
<td><em>(2 EC, sem 1)</em> Sketching for CreaTe</td>
<td><em>(2 EC, sem 2)</em> Designing in context</td>
</tr>
<tr>
<td></td>
<td><em>(2 EC, sem 1)</em> Graphic design</td>
<td><em>(3 EC, sem 2)</em> Human factors</td>
</tr>
<tr>
<td><strong>9 EC Smart Technologies</strong></td>
<td><em>(3 EC, sem 1)</em> Smart environments</td>
<td><em>(6 EC, sem 1-2)</em> Dynamical systems</td>
</tr>
<tr>
<td><strong>8 EC New Media</strong></td>
<td><em>(3 EC, sem 1)</em> Web technology</td>
<td><em>(5 EC, sem 2)</em> Interactive visualization</td>
</tr>
<tr>
<td><strong>8 EC Computer Science</strong></td>
<td><em>(3 EC, sem 1)</em> Introduction to Computer Science</td>
<td><em>(5 EC, sem 1)</em> Programming for CreaTe</td>
</tr>
<tr>
<td><strong>9 EC Mathematics</strong></td>
<td><em>(3 EC, sem 1)</em> Motion and modelling</td>
<td><em>(3 EC, sem 2)</em> Statistics and probability</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>(3 EC, sem 2)</em> Signals and systems</td>
</tr>
<tr>
<td><strong>60 EC Year 1</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 0 EC                            | 3 | 6 | 9 | 12 | 15 |

---

3.2 CREATE Programme, YEAR 1
<table>
<thead>
<tr>
<th>Category</th>
<th>SEMESTER 1</th>
<th>SEMESTER 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 EC Creative Applications</td>
<td>(8 EC, sem 3)</td>
<td>(9 EC, sem 4)</td>
</tr>
<tr>
<td></td>
<td>Ambient screens</td>
<td>Hybrid worlds</td>
</tr>
<tr>
<td>2 EC Creative Explorations</td>
<td>(2 EC, sem 3-4)</td>
<td>(2 EC, sem 4)</td>
</tr>
<tr>
<td></td>
<td>CE in art, science and technology</td>
<td>Digital content creation tools</td>
</tr>
<tr>
<td>6 EC Design</td>
<td>(2 EC, sem 3)</td>
<td>(2 EC, sem 4)</td>
</tr>
<tr>
<td></td>
<td>3D modelling</td>
<td>Advanced graphic design</td>
</tr>
<tr>
<td>6 EC Business</td>
<td>(3 EC, sem 3)</td>
<td>(3 EC, sem 4)</td>
</tr>
<tr>
<td></td>
<td>Design marketing</td>
<td>Business management</td>
</tr>
<tr>
<td>15 EC Smart Technology³</td>
<td>(4 EC, sem 3)</td>
<td>(4 EC, sem 4)</td>
</tr>
<tr>
<td></td>
<td>Control systems</td>
<td>Introduction to electronics</td>
</tr>
<tr>
<td>15 EC New Media³</td>
<td>(3 EC, sem 3)</td>
<td>(6 EC, sem 3-4)</td>
</tr>
<tr>
<td></td>
<td>Web 2.0 Mashups</td>
<td>Virtual environments</td>
</tr>
<tr>
<td>8 EC Computer Science</td>
<td>(5 EC, sem 3)</td>
<td>(3 EC, sem 4)</td>
</tr>
<tr>
<td></td>
<td>Programming with structures</td>
<td>Data-driven applications</td>
</tr>
<tr>
<td>6 EC Mathematics</td>
<td>(3 EC, sem 3)</td>
<td>(3 EC, sem 4)</td>
</tr>
<tr>
<td></td>
<td>Strategies and protocols</td>
<td>Queues and logistics</td>
</tr>
<tr>
<td>60 EC Year 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

0 EC 3 6 9 12 15 17

3.3 CREATE Programme, YEAR 2

³ Each student chooses a track and takes either the ST courses or the NM courses, but not both.
<table>
<thead>
<tr>
<th>Category</th>
<th>Courses</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 EC</td>
<td>Free space to establish a profile</td>
<td>(30 EC, sem 5) Profileringsruimte</td>
<td></td>
</tr>
<tr>
<td>15 EC</td>
<td>Electives</td>
<td></td>
<td>(15 EC, sem 6) Electives</td>
</tr>
<tr>
<td>15 EC</td>
<td>Graduation Project</td>
<td></td>
<td>(15 EC, sem 6) Graduation project</td>
</tr>
<tr>
<td>60 EC Year 3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 0 EC | 9 | 18 | 27 | 36 | 45 |

3.4 CREATE Programme, YEAR 3
3.3 Electives

In the third year each student takes elective courses, with a total study load of 15 EC.

The choice of electives is limited by the constraints that
• At least one of the electives should address professional standards and ethical issues;
• At least one of the electives should address the interaction between humans and technology.

Examples of units of study in these fields offered by the university are:
Mens-Product relaties, Interface en interactieontwerp, Psychologische functieleer, Cognitieve Ergonomie, Toegepaste cognitieve psychologie, Design en emotie, Human error, Nieuwe media en maatschappij, Living in a digital world, Techniekfilosofie, Ethiek: de beroepsverantwoordelijkheid van de ingenieur, Ethics and Technology, Computer Ethics.

The third elective (maximum 5 EC study load) can be used to assist a fellow student in his graduation project. See section 3.6 Bachelor graduation project below.

3.4 Transitional arrangements

To participate in units of study of the second year students must meet two conditions:
a. They are registered as either New Media or Smart Technology students.
b. They have completed study units of the first year with a total study load of at least 40 credits.

To take ST units as a specialization in the second year, at least 10 credits in MA and/or ST of the first year must have been completed.

To take NM units as a specialization in the second year, at least 10 credits in CS and/or NM of the first year must have been completed.

To participate in units of the third year, students must meet a single condition
c. They have completed study units of the first and second years with a total study load of at least 80 credits.

To start their Final Project, students must have completed all other units of the programme.
3.5 Free space to establish a profile (“Profieleringsruimte”)

The third year has “profieleringsruimte” (free space for students to establish their profile). According to university policy, you can use semester 5 (totalling 30 EC) for various purposes. You select a module of units of study totalling 30 credits. Your choice may serve e.g.

- to prepare for further study in the Master’s programme Communication Studies;
- to prepare for further studies in Industrial Design Engineering;
- to prepare for further studies in Mechatronics or Electrical Engineering;
- for courses (and projects) of the minors Ondernemerschap or Management to prepare for a role on the labour market.

A stay of one semester at another (foreign) university is also an option. And finally, if you want to broaden your knowledge in related topics which are not in the curriculum (e.g. computer music, image or language processing), you can use your “profieleringsruimte” to do so.

3.6 Bachelor’s graduation project

If you intend to leave the university with a BSc degree only, the project is the proof that you are ready for a career as a creative technologist in industry, practically oriented, and on an academic level. If you continue your education in an MSc programme, the BSc project should also show you the challenges of doing more in depth research and stimulate you to deepen knowledge.

Bachelor projects may be carried out in the university labs and/or with external partners. Students will do their projects under the common supervision of external and university experts.

Typical contexts within the EWI faculty for such projects are in the following groups:
- HMI – Prof. Dr. A. Nijholt – playful interaction, ludic design, multimodal interfaces;
- Telemedicine – Prof. Dr. M.M.R. Vollenbroek-Hutten – telemedicine and e-health, scenarios in virtual worlds;
- Database Group – Prof. Dr. P.M.G. Apers – applications of data collection in sensor networks;
- Semiconductors – Prof. Dr. J. Schmitz – animation of micro-chip production processes.
In the project you have to realize a design to improve the world of a ‘customer’. Business aspects, cost price and life-cycle issues will be important. The BSc project will cover the complete cycle of a design, including initiation, project planning, development, and possibly even deployment and marketing.

In connection with the Bachelor’s projects, you are stimulated to cooperate and assist each other, in order to achieve, within the time constraints imposed by the project, an optimal result, both in terms of external visibility as well as individual development. To support such cooperation, you can ‘hire’ expertise from another student. This expertise may be technological (to make the prototype), human or business-related. Students who are hired may thus earn a maximum of 5 credits out of 15 EC in the third year for their elective courses. It is the responsibility of the student doing the Bachelor’s project to arrange a clear ‘contract’ about the task of the student hired, and set the milestones. Assessment of the hired student is done jointly with the supervisor.

Apart from the practical work, which preferably results in a prototype or proof-of-concept realization, students are expected to write a report, write the Bachelor’s thesis, and present their work for fellow-students, project stakeholders, and supervising staff.
TEACHING AND LEARNING APPROACH
4.1 Teaching approach

4.1.1 The teaching concept

The Creative Technology curriculum is constructed to meet the following requirements:

1. The programme is application-oriented, concerning both real-life problems to be solved in the form of projects of different complexity, and the acquisition of basic knowledge via ‘learning by doing’.

2. The technical domain spans ICT in a broad sense. Students however choose a focus in this domain. This focus can be either New Media or Smart Technology. They do the fundamentals of both. In projects there will be ample cross fertilisation.

3. The curriculum leaves space for individual development. Projects are structured to challenge students to development of their specific talents. The third year offers the opportunity to prepare for the future on an individual basis.

4. In their studies students develop an academic attitude of inquisitiveness, doubt and rational and analytical thinking, as well as skills in idea generation, abductive reasoning, exploring analogies, and seeking inspiration in arts. These “design thinking” skills are personal, but also collaborative skills. Working together and learning from each other is an essential characteristic of the education.

To meet these requirements, the curriculum is like a story, as we explained in section 2.1.2. You are an active participant in the story. As the story develops, you develop with it, towards the final qualifications.

Teaching and learning is based on a paradigm of explore, practice, feedback, study, and integrate.

You will be constantly encouraged to explore design issues (in problem finding, in idea and concept generation, in prototype development, in evaluation of concepts, in presentation and documentation).

You will not only explore, you will also practice your knowledge and skills.

Next to exploration and practice, you will study. You learn about the underlying physics and the
theories of dynamical systems. You learn about systems of programmable components. You study graphic design, and the principles of modelling and simulation.

And finally you will learn to integrate your knowledge and skills: you will base your exploration (idea and concept generation, prototype development and presentation and documentation) on practice and study.

In each of these aspects, but especially in exploration and practice, you will be closely monitored, and receive feedback on your progress and results.

The effective mix of scenes and developments in the curriculum story is small-grained; the curriculum is divided in small units of study.

This educational approach is not entirely project based, nor purely problem driven, nor only based on the principle of “just in time learning.” The educational concept can be characterized as “mix for diversity and design.”

4.1.2 Teaching methods

As a student you will experience the teaching and learning approach as cycle of events, as follows.

Firstly the lecturer introduces relevant concepts and ideas, illustrated by examples, and invites you to discuss and explore these ideas.

Secondly, the lecturer hands out assignments, which can vary in nature. They can be homework exercises, classroom exercises, practical assignments, assignments concerning planning, assignments concerning presentation, assignments concerning evaluation, group assignments or individual assignments.

Thirdly you make the assignments and hand them in, often with a presentation.

And finally you get feedback, and an evaluation of what you have done. This is an evaluation by the lecturer, but sometimes also by fellow students.

During a course you may go through a number of these cycles, on a weekly basis for instance. But in the larger project-based courses, like the Creative Applications, the organization of assignments,
presentations and feedback may be different. They have a major assignment which takes a cycle of a few weeks.

In some courses the lecturer takes ample time to introduce and illustrate relevant concepts, the assignments support the understanding of the concepts. In other courses the lecturer puts emphasis on the assignments; his introduction serves the assignment, and not the other way round.

4.2 Counselling and tutoring

There are departmental study advisers available for students to give advice and support in all matters concerning their personal situation and their personal development. Your adviser will be mrs. Thea de Kluijver (see section 4.2.4). The adviser helps and supports in personal matters, especially when they interfere with your career as a student. But the adviser can also help and support in matters concerning extracurricular activities, to find stimulus, motivation and reward for your personal development.

For support and feedback on your path towards your final qualifications as a Creative Technology graduate, you will also have a tutor. The tutor is a member of staff with whom you will set your personal learning goals, derived from the general goals of the curriculum and the various courses. Together with the tutor you select essential competencies which deserve your special attention, and together you look for ways to improve these competencies. You report to the tutor on your progress, the tutor gives you feedback on your achievements. The things you do together with the tutor are aligned with the things you do in projects and courses.

The tutor takes care of 8-10 students, in this tutor group you exercise peer reviewing and intervision, to learn from each other.

You and your group will meet the tutor on a regular basis. In the course timetable an afternoon is scheduled free for tutoring.

Part of the tutoring process is a portfolio, which serves to demonstrate your growth towards the final qualifications, and your achievements in design.
4.2.1 Counselling and tutoring in the first year

There will be regular tutoring meetings, throughout the year.

During the introduction, the first year students will be introduced to the study adviser. In the first quarter you will meet with the study adviser for an introductory interview. The study adviser monitors student’s first year results and their study progress. If necessary, she will make an appointment with you, or you can request an appointment yourself.

After the first examination period, you will receive a ‘pre-advice’ on your study progress. At the end of the first study year you will receive an official assessment of your study progress, and your prospects for a successful study. This study progress assessment isn’t binding.

4.2.2 Counselling and tutoring in the second and third year

There will be regular tutoring meetings, during the year. The study adviser may invite you for a meeting, if your study results are insufficient. Students can also contact the study adviser to make an appointment. The study adviser can offer assistance and give information on study courses, planning, exams, personal circumstances, etc.

The study adviser also monitors the progress of students. At the end of each semester the student’s progress is evaluated, to determine whether continuation is recommended and whether there are particular areas where improvement is needed. If you receive a negative advice, we strongly recommended you to contact the study adviser.

During your study information meetings will take place. These meetings are about various practical topics: organisation of the second year, organisation of the third year, elective courses information, minormarket, preparation of your Masterchoice.
4.3 Counsellors

The study adviser for Creative Technology students is mrs. Thea de Kluijver. If you have any questions about the regulations within the programme, or if you want to talk about study related issues, you can contact her.

Thea de Kluijver
Building Zilverling, room 1003
Telephone: 053 489 3697
E-mail: t.h.dekluijver@utwente.nl
CREATE Programme

year 1
## 5.1 First year goals and their curriculum support

<table>
<thead>
<tr>
<th>Goal</th>
<th>Units of study supporting the goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>(Design in general)</strong> He is familiar with problem finding, and with idea and concept generation. He is aware of (web 2.0) business models and the societal context of projects, he can identify opportunities for exploitation of a technology, and he is familiar with requirements analysis, concept development, project planning and project-management. He can realize basic prototypes. He can present and defend ideas. He is aware of the Human engineering analysis method for obtaining insight in user needs and wishes, and he is aware of the methods principles and limitations of usability testing.</td>
<td>These qualifications result from the student’s successful participation in the Creative Applications study units, and partly also from the Smart Technology units and the Design units, in particular the Human Factors unit.</td>
</tr>
<tr>
<td>2. <strong>(Graphic design)</strong> He is familiar with visual communication of concepts and ideas (making concept sketches and explanatory drawing, pictograms, icons, use of colour, fonts, style, readability), he is aware of information visualization issues, he is familiar with the use of visuals and collages to express desired feelings and emotions, and he is familiar with the use of visuals and collages to express a desired design solution.</td>
<td>These qualifications result from the student’s successful participation in the Design units of study, and partly from the New Media units (in particular the Interactive Visualization course).</td>
</tr>
<tr>
<td>3. <strong>(Modelling, planning and simulation)</strong> He is fluent in using MATLAB when it comes to functions, vectors, matrices, solving ordinary differential equations and the analysis of time signals. He can use 20-sim software to make (simulation) models of complex systems with a feedback structure, and he can translate the simulation into differential equations. He can analyze and model time signals. He is familiar with basic concepts of probability and statistics.</td>
<td>These qualifications result from the student’s participation in the Mathematics units of study and the Smart Technology units (in particular Dynamical Systems).</td>
</tr>
</tbody>
</table>
4. **(Systems of programmable components)** He is aware of the basic concepts of computer architecture, operating systems, protocols, networks, languages and databases. He is fluent in writing and debugging simple computer programmes. He is familiar with the use of automatically generated code. He is aware of standard solutions and libraries, and of programme complexity.

These qualifications result from the student’s successful participation in the Computer Science units of study.

5. **(New Media)** He is familiar with the computational infrastructure provided by the web platform; he is fluent in authoring web pages and the use of tools for that purpose, he is familiar with XML. He can develop simple physics-based animations.

These qualifications result from the student’s participation in the New Media units of study.

6. **(Other qualifications)** He is familiar with collaborating in teams, he is aware of team roles, he is familiar with presenting and defending ideas (from “elevator pitch” to elaborate presentation); he is familiar with critical reflection on his own ideas and others, he is familiar with writing essays and is aware of the requirements a good essay must fulfil; he is familiar with the use of other media to communicate.

These qualifications result from the way education and assessment has been organized. The student participates in relevant events and gets feedback on his participation.
## 5.2 CreaTe Programme, Year 1

<table>
<thead>
<tr>
<th>Category</th>
<th>SEMESTER 1</th>
<th>SEMESTER 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 EC Creative Applications</td>
<td>(3 EC, sem 1) We create identity</td>
<td>(6 EC, sem 1-2) Living and working tomorrow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(6 EC, sem 2) Have fun and play</td>
</tr>
<tr>
<td>2 EC Creative Explorations</td>
<td></td>
<td>(2 EC, sem 2) Creative exploration of structures</td>
</tr>
<tr>
<td>9 EC Design</td>
<td>(2 EC, sem 1) Sketching for CreaTe</td>
<td>(2 EC, sem 2) Designing in context</td>
</tr>
<tr>
<td></td>
<td>(2 EC, sem 1) Graphic design</td>
<td>(3 EC, sem 2) Human factors</td>
</tr>
<tr>
<td>9 EC Smart Technologies</td>
<td>(3 EC, sem 1) Smart environments</td>
<td>(6 EC, sem 1-2) Dynamical systems</td>
</tr>
<tr>
<td>8 EC New Media</td>
<td>(3 EC, sem 1) Web technology</td>
<td>(5 EC, sem 2) Interactive visualization</td>
</tr>
<tr>
<td>8 EC Computer Science</td>
<td>(3 EC, sem 1) Introduction to Computer Science</td>
<td>(5 EC, sem 1) Programming for CreaTe</td>
</tr>
<tr>
<td>9 EC Mathematics</td>
<td>(3 EC, sem 1) Motion and modelling</td>
<td>(3 EC, sem 2) Statistics and probability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3 EC, sem 2) Signals and systems</td>
</tr>
<tr>
<td>60 EC Year 1</td>
<td>0 EC</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>12</td>
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<tr>
<td></td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>
## 5.3 Study units descriptions

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>EC</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>196700510 (CE1)</td>
<td>Creative Exploration of Structures</td>
<td>2.0</td>
<td>44</td>
</tr>
<tr>
<td>196700610 (CA1)</td>
<td>We create identity</td>
<td>3.0</td>
<td>44</td>
</tr>
<tr>
<td>196700620 (CA2)</td>
<td>Living and working tomorrow</td>
<td>6.0</td>
<td>45</td>
</tr>
<tr>
<td>196700630 (CA3)</td>
<td>Have Fun and Play!</td>
<td>6.0</td>
<td>45</td>
</tr>
<tr>
<td>196700210 (DE1)</td>
<td>Sketching for CreaTe</td>
<td>2.0</td>
<td>46</td>
</tr>
<tr>
<td>196700220 (DE2)</td>
<td>Graphic design</td>
<td>2.0</td>
<td>46</td>
</tr>
<tr>
<td>196700230 (DE3)</td>
<td>Designing in context</td>
<td>2.0</td>
<td>47</td>
</tr>
<tr>
<td>196700240 (DE4)</td>
<td>Human Factors</td>
<td>3.0</td>
<td>47</td>
</tr>
<tr>
<td>191567010 (MA1)</td>
<td>Motion and Modelling</td>
<td>3.0</td>
<td>48</td>
</tr>
<tr>
<td>191567020 (MA2)</td>
<td>Signals and Systems</td>
<td>3.0</td>
<td>48</td>
</tr>
<tr>
<td>191567020 (MA3)</td>
<td>Statistics and probability</td>
<td>2.0</td>
<td>49</td>
</tr>
<tr>
<td>196700410 (CS1)</td>
<td>Introduction to Computer Science</td>
<td>3.0</td>
<td>50</td>
</tr>
<tr>
<td>196700420 (CS2)</td>
<td>Programming for Creative Technology</td>
<td>5.0</td>
<td>50</td>
</tr>
<tr>
<td>196700110 (NM1)</td>
<td>Web Technology</td>
<td>3.0</td>
<td>51</td>
</tr>
<tr>
<td>196700020 (NM2)</td>
<td>Interactive Visualization</td>
<td>5.0</td>
<td>51</td>
</tr>
<tr>
<td>196700110 (ST1)</td>
<td>Smart Environments</td>
<td>3.0</td>
<td>52</td>
</tr>
<tr>
<td>196700120 (ST2)</td>
<td>Dynamical Systems</td>
<td>6.0</td>
<td>53</td>
</tr>
</tbody>
</table>
CE1 Creative Exploration of Structures

In this course structures will be investigated mentally and visually. Understanding structures is essential to explore different problem-solving methods and to create variations of designs and visualization by hand or by computer. During the course students will explore different topics, providing insight into and hands-on experience with abstract and visual representations of structures and problem-solving patterns, providing food for the mind and the eyes.

The following topics will be handled:
2. The painter as a mathematician – Linear perspective and anamorphoses.
3. Infinity and beyond – the Cantor method and Hilbert’s paradox of The Grand Hotel.
5. Paths explored – the notion of graph, Hamilton circle, travelling salesman problem, search and complexity.
6. Visual patterns for design – structure of design patterns will be investigated.

CA1 We create identity

The goal of the course, which will take the structure of a group project, is to set a new group of students to work, to learn about the topics of creative technology, to get to know each other and the staff, and to find ways of expressing their interests and viewpoints in a variety of ways, including blogs, (interactive) videos, and wikis, using commonly available Web 2.0 community services.

Equally important is that students discover the means that are at their disposal to communicate and document their work in individual portfolios, using basic tools for web development and content creation.
CA2  Living and working tomorrow

In this creative application, the student explores in a group, the application of several new technologies in a future living or working situation. This requires:

• an investigation into the new technologies;
• generation of several application scenarios of these technologies;
• development of concepts of products and/or services that apply to one of the generated scenarios;
• creation of a prototype;
• evaluation of the prototype.

In project-lectures the relevant tools are presented. Also, a basic course in writing a report is given.

CA3  Have Fun and Play!

The course is meant as an integrative project, which combines the various elements introduced in the first year of creative technology, where students experience the need for planning and project-management. Topics include:

• application of creative technology elements;
• explore combination smart technology & new media;
• development interactive game play;
• write business & communication plan;
• reflection on societal context of media & smart system deployment.

Although acquisition of the actual theme of the project must be done by senior staff, students will be expected to take an active part in the selection of theme(s) and target(s), and developing the final application(s) or product(s).
DE1  Sketching for CreaTe

In this course basic skills will be developed for the expression of ideas and concepts through sketching. With practical lab training the basic principles of perspective drawing are taught. Topics:

- Perspective and drawing-rules for shapes and environments;
- Learning to look and see the construction of the 3d world;
- Design drawing as a tool in the early stage of product development;
- Drawing as a communication tool;
- Drawing as an aid for idea-development.

DE2  Graphic design

Basics of graphic design. Understanding and application of design principles in two-dimensions. Topics to be addressed in theory and practical exercises;

- Fonts; type, style and readability;
- Layout and grid;
- Application of color;
- Symbols pictograms and icons;
- Hierarchy and structure in information;
- Relationship between text and visual information.
DE3  Designing in context

Coursecode: 196700230  |  Study load: 2.0 EC

In this course the students will attain basic understanding of principles and methods for designing products and services within context. New developments are not isolated, but will exist in a context characterized by the environment, users, stakeholders, society, fashion, trends et cetera. The participants will understand the relevance of this context and practice with the identification and visualisation of this context for design purposes.

DE4  Human Factors

Coursecode: 196700240  |  Study load: 3.0 EC

The course provides basic insight in the delimiters for designing products and services that users understand.

Components of the course:

- Evaluating and redesigning an existing user interface design from user perspective (this can be either an example from an existing interactive application, or student’s own work from previous creative applications);
- Making a relevant List of Requirements for your own design from user perspective;
- Designing a user interface from Human Factors guidelines;
- Evaluating your design with usability testing.
MA1  Motion and Modelling

In this course basic elements of analysis are introduced with the aim to discuss ordinary differential equations and their solution. Attention will be given to functions, vectors and matrices with the sole purpose of discussing dynamical systems as occur in smart technologies and java applications. In total 8 plenary lectures and 12 exercise classes will be included.

In addition, a short project will be devoted to illustrating a ‘shooting method’, including elements of numerics, Matlab and visualization. A simple game will be developed as exercise for the students. The work-load of the project will be 0.5 EC, 1.5 EC will be allocated to the plenary lectures and exercise classes and 1 EC is for study by the students, monitored with homework.

MA2  Signals and Systems

For many application areas, students should be able to analyse time signals. In order to understand the essence of signals, a decomposition of a signal in terms of sine/cosine functions is introduced. Its use is shown through motivating examples such as filters for removing noise from a signal but also how different radio signals can be transmitted with limited interference. Dynamical systems such as mechanical or electrical networks are often described through differential equations influenced by external time signals such as forces or voltages. The superposition principle will help us to understand the effects of these external time signals in case of linear systems.

In total 8 lectures and 12 exercise classes will be included.
MA3  Statistics and probability

Concepts from probability theory will be familiarized, such as ‘probability’, ‘stochastic variable’, ‘probability distribution’, ‘expectations’ and ‘variance’. Statistics comes into play as soon as we deal with unknowns. In a number of simple situations the estimation of unknowns is required. We will also consider ‘confidence intervals’ to characterize the accuracy of estimation. Finally, we consider the theory of statistical testing, which allows statements to be made on the basis of research results. Applications will involve noisy signals. Students will be able to design, implement and interpret the outcome of statistical tests.
CS1  Introduction to Computer Science

This course gives an introductory overview over the topics of computer science that are relevant for Creative Technology. The context of phenomena and the relationship between concepts are treated extensively. The following areas will be addressed:
- Computer architecture;
- Operating systems;
- Protocols;
- Languages;
- Networks;
- Databases.

CS2  Programming for Creative Technology

- Basic programming skills in C++ and C;
- Common language concepts and constructs, such as types, variables, binding and scope, functions and procedures;
- Basic principles of object oriented languages, such as objects, classes and subclasses, inheritance, inclusion polymorphism;
- Applications come from New Media as well as from Smart Systems by, e.g., NXT Lego robot control.
NM1  Web Technology

The course presents elementary web technology, primarily focussed on the use of HTML, XML, CSS, and JavaScript, needed for authoring dynamic web pages.

Recommended literature: JavaScript: The Definitive Guide by David Flanagan
Online reference(s): http://www.w3schools.com/

NM2  Interactive Visualization

The course will address the development of rich media applications using current web-based media technology, with a special focus on animation and interactive visualization(s) of dynamic complex systems.

The platform used will be Adobe flex / as3.

Recommended literature:
• Foundation Actionscript 3.0 Animation: Making Things Move! - By Keith Peters
• Online reference(s): http://livedocs.adobe.com/flex/3
ST1 Smart Environments

The course gives an introduction to smart technology and environments, their history and relation to embedded systems. It shows how developments in computer and sensor technology have led to smart systems. Smart systems, as found in e.g. ambient intelligence, are networks of embedded computers and smart sensors that offer new and innovative services deemed impossible with traditional computers. These systems support people in their daily live in an unobtrusive way. Examples can be found in leisure and entertainment, but also in more serious applications like intelligent houses, offices, and cars and traffic control. In parallel to, and inspired by the lectures, the students have access to the SmartXP laboratory to gain hands-on experience with smart technology. In a group, students design and build a prototype based on ready-to-use smart technology components such as sensors, sensor nodes, RFID tags and Smartphones. During the course the students present their ideas, designs and prototypes.

The following subjects are addressed in the course:

- Smart technology, what it is and what it is not;
- Smart systems, smart sensors, wireless sensor networks;
- Sensor technology;
- Ubiquitous computing, Marc Weiser’s vision;
- Critical issues: privacy, trust, scalability, aesthetics, annoyances;
- State of the art, examples, case studies;
- Introduction to the SmartXP Lab;
- Group exercise: design a smart environment application and build a prototype based on ready-to-use components.
ST2  Dynamical Systems

Models of dynamical systems and simultaneously introduction to mathematics and physics.

The goal of this course is to get insight in the behaviour of dynamical systems, in the continuous-time as well as in the discrete time domain. Based on simple examples from society, biology and engineering the students will learn to make abstractions of such systems, by first detecting the relations between the elements of such systems and next by creating models of such systems that can be simulated in 20-sim. The simulation models will form the basis for a more mathematical description of such systems in the form of differential equations.
CREATE Programme
year 2
## 6.1 Second year goals and their curriculum support

<table>
<thead>
<tr>
<th>Goal</th>
<th>Units of study supporting the goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (Design in general) He is fluent in problem-finding, and in idea</td>
<td>These qualifications result from the student’s successful participation in the Creative Applications study units.</td>
</tr>
<tr>
<td>and concept generation. He is aware of security and privacy issues;</td>
<td></td>
</tr>
<tr>
<td>he is familiar with concept development for interaction with</td>
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<tr>
<td>non-computer screens, and concept development relating the real to</td>
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<tr>
<td>the virtual world. He is fluent in content production, workflow</td>
<td></td>
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<tr>
<td>and project management.</td>
<td></td>
</tr>
<tr>
<td>2. (Graphic design) He is familiar with building geometry and</td>
<td>These qualifications result from the student’s successful participation in the Design units of study.</td>
</tr>
<tr>
<td>with sound and movement in graphic design. He is familiar with the</td>
<td></td>
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<tr>
<td>level of abstraction in information visualization. He can match</td>
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<tr>
<td>tools and content creation tasks, and is aware of issues of</td>
<td></td>
</tr>
<tr>
<td>exchange and interoperability.</td>
<td></td>
</tr>
<tr>
<td>3. (Modelling, planning and simulation) He is familiar with the</td>
<td>These qualifications result from the student’s successful participation in the Mathematics units of study.</td>
</tr>
<tr>
<td>basic foundations of game theory and can work with concepts of</td>
<td></td>
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<tr>
<td>game theory. He is aware of system behaviour under the influence of</td>
<td></td>
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<tr>
<td>randomness and of the use of Markov chains, queuing and optimization</td>
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<tr>
<td>in this context.</td>
<td></td>
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<tr>
<td>4. (Systems of programmable components) He is fluent in OO-</td>
<td>These qualifications result from the student’s successful participation in the Computer Science units of study.</td>
</tr>
<tr>
<td>programming, and can use standard libraries and standard</td>
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<tr>
<td>algorithms. He is aware of the complexity of standard algorithms.</td>
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<tr>
<td>He can structure data-driven problems to derive a clear interface</td>
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<tr>
<td>to a database, and he is fluent in generating database applications.</td>
<td></td>
</tr>
<tr>
<td>5. (Business and marketing) He familiar with the basics of marketing</td>
<td>These qualifications result from the student’s successful participation in the Business units of study, and in the Creative Applications (of the first and the second year).</td>
</tr>
<tr>
<td>and business management and can apply simple business principles</td>
<td></td>
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<tr>
<td>in developing products. He can develop a business plan including</td>
<td></td>
</tr>
<tr>
<td>the descriptions of product and product development (with estimation</td>
<td></td>
</tr>
<tr>
<td>of development costs), a market analysis and analysis of</td>
<td></td>
</tr>
<tr>
<td>competitors.</td>
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</tr>
</tbody>
</table>
### 6. (New Media) He is aware of the application of games in education and learning. He is familiar with the concepts and techniques for the design of serious games, and he can analyze games using game patterns. He is aware of technologies for networked 3D environments. He can build interactive X3D/VRML applications and he can script interactive behaviour in 3D virtual worlds.

These qualifications result from the student’s successful participation in the New Media units of study.

### 6. (Smart Technology) He is familiar with basic methods for measuring quantities in various physical domains, and with the sensors commonly used for these measurements. He is aware of the general performance and the basis limitations of these sensors. He understands the most important electronic functions of a data acquisition system, and he understands the effects of sampling and quantisation on the quality of a measured signal. He can model and optimize communication systems, and he can integrate communication systems in new products. He knows how feed-forward and feedback control can be used to modify the performance of a system. He knows how an accurate control system can be build that is insensitive for disturbances and parameter variations. He knows the consequences of using digital computers in control systems.

These qualifications result from the student’s successful participation in the Smart Technology units of study.

### 7. (Other qualifications) He is fluent in collaborative efforts and can take different team roles; he is fluent in presentation, defence and documentation, both orally and in writing; he is fluent in critical reflection on his own ideas and the ideas of others; he is familiar with the evaluation of concepts and ideas at various levels; he is aware of ethical dilemmas a designer may face.

These qualifications result from the way education and assessment has been organized. The student participates in relevant events and gets feedback on his participation.
### 6.2 CreaTe Programme, Year 2

<table>
<thead>
<tr>
<th>Category</th>
<th>SEMESTER 1</th>
<th>Courses</th>
<th>SEMESTER 2</th>
<th>Courses</th>
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<td></td>
<td>(9 EC, sem 4) Hybrid worlds</td>
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<tr>
<td>Applications</td>
<td></td>
<td>(2 EC, sem 3-4) CE in art, science and technology</td>
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<tr>
<td>Explorations</td>
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<td></td>
<td></td>
<td>(2 EC, sem 4) Digital content creation tools</td>
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<tr>
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<td>(2 EC, sem 4) Advanced graphic design</td>
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<td>(3 EC, sem 3) Design marketing</td>
<td>(3 EC, sem 4) Business management</td>
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<td>15 EC Smart</td>
<td>(4 EC, sem 3) Control systems</td>
<td>(4 EC, sem 4) Introduction to electronics</td>
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<td>(4 EC, sem 3) Wireless communication systems</td>
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<td>(3 EC, sem 4) Sensors</td>
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<td>(3 EC, sem 3) Web 2.0 Mashups</td>
<td>(6 EC, sem 3-4) Virtual environments</td>
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<td>8 EC Computer</td>
<td>(5 EC, sem 3) Programming with structures</td>
<td>(3 EC, sem 4) Data-driven applications</td>
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## 6.3 Study units descriptions

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<td>201000084 (MA4)</td>
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<td>- (MA5)</td>
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<td>Web2.0 Mashups</td>
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CE2  Creative Explorations in Art, Science and Technology

This ‘course’ is a slot, providing space to encourage and acknowledge student’s own explorations on (the intersection of) art, science and technology. Students may:

• give a mini-seminar on a technological tool or application they have seen or learnt to master;
• reflect on an exhibition or festival they had been to;
• participate in or initiate some artistic activity (e.g. creating a sculpture or a laser show, may be with an artist in resident);
• provide entry to some reputed festival;
• compile and present an illustrated survey on history of e.g. computer animation, organize debate on some ethical issues or a creative idea.

In general, students may use these credits to explore topics beyond the curriculum, and share the result of their exploration with the rest of the students (and staff).

CA4  Ambient Screens

The course is meant as an integrative project, with a special focus on the ubiquitous availability of screens outside the workplace and personal home computer. Projects in this course concern finding creative solutions for interaction with this multitude of screen displays.

Online reference(s):

• http://smart-its.org
• http://idisplays.info
• http://www.deutsche-telekom-laboratories.de/~rohs/wikeye

Remark: If possible the project(s) will be executed in the University’s VR facility, the T-Xchange-Cell: http://www.txchange.nl with the goal of developing scenario-based serious games.
CA5 Hybrid Worlds

The course is meant as an integrative project, with a special focus on the relation between the real world and the virtual world, not only in a metaphorical sense, but rather as expressed by the notion of the internet of things.

Topics addressed include RFID identification, geo-tagging, and other sensors in combination with online monitoring, logistics. Students are encouraged to design smart systems where (wireless) sensors and feedback control, realized in microcomputers play a major role. Such systems could be autonomous robots (e.g. robotics vacuum cleaners and so on), traffic control systems, but could also be partly in the real and partly in the virtual world. Dependent on specialisation and interest students are encouraged to explore issues of smart systems, logistics and traffic management, or playful applications in an urban context. In this context the phrase hybrid may also be understood as multicultural.

Online reference(s):

DE5 3D modelling

In this course basic skills will be developed for the virtual modelling of geometry and shapes. With practical lab training the basic principles of 3d space are taught. Topics:
- Building geometry;
- Solid and surface modelling;
- Virtual space.
DE6  Advanced graphic design

Coursecode: 196700260 | Study load: 2.0 EC

Advanced application of graphic design. Understanding and application of design principles in two-dimensions, including sound and motion. This course will further develop the topics of Graphic Design (DE3), extended with the following topics:

- Exploration of visual styles and Personality;
- Level of abstraction in visual information;
- Movement in visual information;
- Application of sound in enhancing visual information.

DE7  Digital content creation tools

Coursecode: 196700270 | Study load: 2.0 EC

The course will cover a range of (standard) digital content creation tools, including tools for graphic design, such as Adobe Photoshop, Illustrator, tools for movie post-production, such as Adobe Premiere and AfterEffects, and tools for 3D modelling and rendering, including Maya, 3D Studio Max and Blender. Topics addressed in the course include: forms of representation and exchange formats, interoperability and the place of the various tools in the workflow/process of content creation.

Online reference(s):
- http://www.adobe.com/products
- http://usa.autodesk.com
- http://www.collada.org
MA4 Strategies and Protocols

In our technologically advanced society, decentralization is not only omnipresent, but inevitable: Think of the functioning of sensor or computer networks, the organization of traffic, both on the streets or through the internet, or of auctions as an economic platform to make business. This course provides the basic foundation to understand, analyze, and design such decentralized systems. This includes basic foundations of game theory and provides an introduction to mechanisms design. Practical applications such as traffic routing, scheduling and internet protocols will be discussed.

The course is comprised of 8 plenary lectures, as well as 12 exercise sessions in which both theoretical issues and practical implementations are discussed. The latter with the help of adequate software (Matlab).

MA5 Queues and logistics

In this course basic elements of stochastic systems are introduced with the aim to give insight into the influence of randomness on system behaviour. Emphasis will be on insight into mathematical modelling and rules of thumb. Attention will be given to Markov chains, queueing problems and optimization, including decision processes under uncertainty.

In total 8 exercise classes will be provided to actively work with the theory. In addition, 4 exercise classes will be devoted to building a simulation environment to mimic the behaviour of an elementary logistics system of communicating items (Internet of Things).
CS3  Programming with Structures

- More advanced programming concepts;
- Using the STL standard library;
- Abstract data structures.

CS4  Data-driven applications

The course is an application driven approach to databases.
We focus more on practical applications than on data-base theory.
As state of the art language and tools, PHP and mySQL are treated.
NM3  Web2.0 Mashups

The course presents advanced web technology, that allows for the development of data-driven dynamic web applications, using web services, such as Google maps and AJAX, XML and JSON, in the Rich Internet Application, provided by flex /as3.

Recommended literature: Professional Web 2.0 Programming, by Eric van der Vlist, Danny Ayers, Erik Bruchez, Joe Fawcett, Alessandro Vernet

Online reference(s):
•  http://code.google.com
•  http://www.adobe.com/devnet/flex

NM4  Virtual Environments

The course introduces virtual environments, more in particular 3D virtual environments, such as deployed for online games and communities, as well as for scientific data visualisation. The course will focus on open standards for web 3D, that is X3D and VRML, and also discuss extensions to flex / as3 for developing 3D immersive applications, such as Papervision3D.

Recommended literature: Professional Web 2.0 Programming, by Eric van der Vlist, Danny Ayers, Erik Bruchez, Joe Fawcett, Alessandro Vernet

Online reference(s):
•  http://www.x3dbook.com/slidesets
•  http://www.web3d.org
•  http://blog.papervision3d.org
NM5  Game Development

The course gives an introduction in the design development of (digital) games. Attention will also be given to the analysis and critical comparison of games, using game interaction patterns, as well as popular technologies for games, both online such as flex / as3, and PC and console based games, including DirectX, XNA, and the Half Life 2 SDK.


Online reference(s): http://www.gamedesignpatterns.org

ST3  Control Systems

Feedback control systems, including topics:
- Refresh modelling of dynamical systems and basic control concepts;
- System descriptions with transfer functions, frequency domain descriptions (bode plots, nyquist plots) and in the time domain;
- Feed-forward and feedback control structures. Accuracy, sensitivity and stability;
- Controller design in different domains ($s$, $j\omega$, $t$);
- Introduction to optimal control;
- Digital control systems.
ST4  Wireless Communication Systems

- Design, modelling and implementation of modern and future (wireless) communication systems;
- Basic concepts of communication systems, transmission, communication channels, electromagnetic fields, radio communication;
- Examples of applications such as WiFi, Bluetooth, short range radio networks.

ST5  Introduction to Electronics

Electronic circuits and systems for the processing of analogue sensor signals; amplifiers, filters, AD-converters. The objective of this course is to provide basic knowledge of electronics, in particular, about the structure, functionality and properties of an electronic data acquisition system as the connection between a sensor and the computer.

After having successfully completed this course, the student should:
- understand the most important electronic functions of a data acquisition system;
- be able to formulate and interpret specifications of an instrumentation system;
- have knowledge on the basic properties of diodes and transistors (bipolar and field effect);
- be able to design an electronic amplifier, using operational amplifiers, for a specific application;
- be able to design an electronic filter (either passive or active) according to a given set of specifications;
- be able to design an interface circuit for a resistive, capacitive, inductive, piezoelectric and optical sensor;
- understand the effects of sampling and quantisation on the quality of the measured signal.
ST6  **Sensors**

Sensors, their properties and applications:

| 1 | general considerations on sensors; specifications | resistive sensors (basics, constructions) |
| 2 | resistive sensing: displacement, rotation, interfacing | resistive sensing: thermal, tactile |
| 3 | capacitive sensors: basics, constructions, permittivity | capacitive sensing: displacement, rotation, interfacing |
| 4 | inductive/magnetic sensors: basics, induction, permeability | measuring magnetic fields (Hall, flux gate, AMR) |
| 5 | inductive sensing: proximity, displacement | inductive sensing: rotation, compass, 2- or 3D position |
| 6 | piezoelectric sensors: basics, piezoelectricity, materials | piezoelectric sensing: pressure, acceleration |
| 7 | optical sensors: components, properties | optical sensing: displacement (intensity); interfacing |
| 8 | optical sensing: encoders; interferometry | acoustic sensors: basics (sound generation, propagation) |
| 9 | acoustic sensing: distance, velocity | navigational sensing (beacons, beaconless) |

BI1  **Design marketing**

This course combines knowledge on business skills, marketing, design and strategy.

Topics are:
- Business plan and research and development;
- Marketing mix;
- Benchmarking as a tool for obtaining design requirements and –strategy;
- Design management principles.
B12  **Business management**

Development of a business plan including mission statement, description of product, product development, description of market, analysis of competitors, sales & marketing, finance, personnel.
APPENDICES
7.1 The Faculty of EEMCS

The Faculty of Electrical Engineering, Mathematics and Computer Science (EEMCS) comprises three disciplines, each of which again has connections with other disciplines.

Besides teaching, research is carried out in the faculties by our research groups/chairs.

This research is entirely clustered in the university research institutes Institute for Nanotechnology (MESA+) and the Centre for Telematics and Information Technology (CTIT), IMPACT and MIRA.
7.1.1 Organisation chart EEMCS

Dean
Dean of the faculty of EEMCS is prof.dr.ir. Ton Mouthaan. With him rests ultimate responsibility for all of the faculty’s educational programmes.

Faculty Council EEMCS
The Faculty Council EEMCS is a representative advisory body of the faculty. The Council consists of eight students and eight staff members. The students are elected annually, the staff members serve on the Faculty Council for a period of two years. Nominations for the Council take place in April, the elections are held in June. The Council’s term of office runs parallel to the academic year.

Depending on the subject at hand, the Faculty Council has advisory powers or the right of consent about the proposed decisions of the faculty dean. If he wants to take decisions about the outlines of personnel policy, regulations in the field of terms of employment and the occupational health and safety policy, the dean requires the consent of the Faculty Council beforehand. The dean also requires the Faculty Council’s consent beforehand if he wants to take decisions on setting or modifying the faculty Education and Examination Regulation (OER), rules in the field of safety, health and well-being or policy on students’ facilities.

For more information concerning the Faculty Council, please refer to:
http://www.ewi.utwente.nl/organisatie/bestuur/faculteitsraad/

The Board of Professors
The Board of Professors consists of all professors and programme directors of the faculty.

7.1.2 Educational programmes
The faculty offers the following educational programmes:

Bachelor’s programmes:
- Electrical Engineering (EE)
- Computer Science (CS)
- Applied Mathematics (AM)
- Creative Technology (CreaTe)
Master’s programmes:

- Applied Mathematics (AM)
- Computer Science (CSC)
- Electrical Engineering (EE)
- Embedded Systems (EMSYS) (3-TU)
- Human Media Interaction (HMI)
- Mechatronics (MT)
- Systems and Control (SC) (3-TU)
- Telematics (TEL)

At the head of every educational programme is a programme director. He marks the outlines of the educational programme and is responsible for the content of the educational programme and its courses.

For EE (BSc and MSc) this is dr.ir. W. Olthuis (Wouter)
For AM (BSc and MSc) and SC this is dr. J.W. Polderman (Jan Willem)
For CSC (BSc and MSc) and TEL this is dr.ir. R. Langerak (Rom)
For CreaTe en HMI this is dr. G.F. van der Hoeven (Gerrit)
For EMSYS this is prof.dr.ir. G.J.M. Smit (Gerard)

7.1.3 Services and units

The faculty has a number of EEMCS-wide service groups which are under the direction of the director of operations, ing. H. van Egmond.

SAFETY AND HEALTH CARE EEMCS

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<thead>
<tr>
<th>Position</th>
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<tr>
<td>Coordinator</td>
<td>ing. S. Visser (Sjoerd)</td>
<td>+31 53 489 3153</td>
</tr>
<tr>
<td></td>
<td>ir. F. Houweling (Frans)</td>
<td>+31 53 489 3583</td>
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### OFFICE OF THE DEAN OF THE FACULTY OF EEMCS (BFD-EEMCS)

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<td>General e-mail address</td>
<td><a href="mailto:BFD_ewi@ewi.utwente.nl">BFD_ewi@ewi.utwente.nl</a></td>
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<tr>
<td>Dean</td>
<td>prof.dr.ir. A.J. Mouthaan (Ton)</td>
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<tr>
<td>Director of Operations</td>
<td>ing. H. van Egmond (Harm)</td>
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<tr>
<td>Faculty secretariat</td>
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<tr>
<td>director of operations and MT</td>
<td>E.C. Bosch-van der Heijden (Els)</td>
<td>+31 53 489 4602</td>
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<tr>
<td>dean</td>
<td>L. Tunc-Katalanc (Lena)</td>
<td>+31 53 489 4427</td>
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### EDUCATION SUPPORT OFFICE EEMCS (BOB-EEMCS)

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<tr>
<td>Manager of Education</td>
<td>H.J. van Laar (Jolanda)</td>
<td>+31 53 489 4466</td>
</tr>
<tr>
<td>Internationalization</td>
<td>drs. J. Schut (Jan)</td>
<td>+31 53 489 4350</td>
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<tr>
<td><strong>Traineeship</strong></td>
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<tr>
<td>Traineeship coordinator</td>
<td>dr. M.J. Korsten (Maarten)</td>
<td>+31 53 489 3887</td>
</tr>
<tr>
<td>Traineeship mediator</td>
<td>B. Jaarsma-Knol (Belinda)</td>
<td>+31 53 489 3887</td>
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<tr>
<td>Quality assurance</td>
<td>drs. J.H. Romkema (Hans)</td>
<td>+31 53 489 2774</td>
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<tr>
<td><strong>Student advisers</strong></td>
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<tr>
<td>Computer Science and Applied</td>
<td>S.B.A.M. Vonk MSc (Sharon)</td>
<td>+31 53 489 5645</td>
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<tr>
<td>Mathematics</td>
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<tr>
<td>Creative Technology and Electrical</td>
<td>T.H. de Kluijver MA (Thea)</td>
<td>+31 53 489 3697</td>
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<tr>
<td><strong>Secretariat</strong></td>
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<tr>
<td>Student advisers,</td>
<td>R. Assink (Remke)</td>
<td>+31 53 489 3426</td>
</tr>
<tr>
<td>Internationalization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality assurance</td>
<td>A. de Bruin-van Willigen (Annemieke)</td>
<td>+31 53 489 3725</td>
</tr>
<tr>
<td>Programme directors</td>
<td>K. Veldhuis (Karin)</td>
<td>+31 53 489 5450</td>
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## COMMUNICATIONS

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<tbody>
<tr>
<td>Manager of Communications</td>
<td>H. Barry-Mulder (Hinke)</td>
<td>+31 53 489 2807</td>
</tr>
<tr>
<td>Bachelor Electrical Engineering</td>
<td>H. Barneveld-Hobbelink (Henriëtte)</td>
<td>+31 53 489 2408</td>
</tr>
<tr>
<td>Bachelor Applied Mathematics</td>
<td>D. Dalenoord (Diana)</td>
<td>+31 53 489 3450</td>
</tr>
<tr>
<td>Bachelor Computer Science</td>
<td>L. Jonker (Linda)</td>
<td>+31 53 489 2745</td>
</tr>
<tr>
<td>Bachelor CreaTe + Masters</td>
<td>S. Bosch (Sarah)</td>
<td>+31 53 489 3586</td>
</tr>
<tr>
<td>Webeditor</td>
<td>M. van Grinsven (Marloes)</td>
<td>+31 53 489 1067</td>
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## PREMISES MANAGEMENT

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<tr>
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<tr>
<td>Premises Manager</td>
<td>ir. M.J.B. ten Bulte (Michel)</td>
<td>+31 54 489 2800</td>
</tr>
<tr>
<td>Service desk</td>
<td><a href="mailto:Servicedesk.Zilverling@fb.utwente.nl">Servicedesk.Zilverling@fb.utwente.nl</a></td>
<td>+31 54 489 4100</td>
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## LIBRARY & ARCHIVE

Library & Archive is a service centre of the University Library of the University of Twente.

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<tbody>
<tr>
<td>Information Specialist</td>
<td>Mrs drs. P. de Willigen (Petri)</td>
<td>+31 53 489 2085</td>
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<tr>
<td>Computer Science, Applied Mathematics</td>
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<tr>
<td>Electrical Engineering</td>
<td>ir. W.C. Oosterling (Wim)</td>
<td>+31 53 489 2079</td>
</tr>
</tbody>
</table>

## FACILITY SERVICE CENTRE

The Facility Service Centre is a shared service centre that offers its services within and for the various faculties, including EEMCS.

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Phone number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service desk</td>
<td><a href="mailto:Servicedesk.Zilverling@fb.utwente.nl">Servicedesk.Zilverling@fb.utwente.nl</a></td>
<td>+31 54 489 4100</td>
</tr>
<tr>
<td>Contact</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hoge kamp, Zilverling, Carré</td>
<td>N.C.M. Heijnekamp (Nancy)</td>
<td>+31 53 489 5768</td>
</tr>
<tr>
<td>Citadel</td>
<td>M. Drewes (Martine)</td>
<td>+31 53 489 6838</td>
</tr>
</tbody>
</table>
ICT SERVICE CENTRE (ICTS)
ICTS is a shared service centre within the University of Twente. The following contacts apply for the faculty of EEMCS.

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Phone number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Account Manager EEMCS</td>
<td>ing. A.B. Tibben (Tonnie)</td>
<td>+31 53 489 3724</td>
</tr>
<tr>
<td>ICTS Service desk</td>
<td><a href="mailto:icts.servicedesk@utwente.nl">icts.servicedesk@utwente.nl</a></td>
<td>+31 53 489 5577</td>
</tr>
</tbody>
</table>

STUDENT & EDUCATION SERVICE CENTRE
The Student & Education Service Centre performs tasks on a central level as well as within the various faculties. The Student & Education Administration (S&OA) EEMCS deals with all sorts of educational affairs and is part of this service centre. The Student & Education Administration is also known as the Bureau Onderwijszaken (BOZ, Educational Affairs Office).

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Phone number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team leader S&amp;EA EEMCS</td>
<td>M.H. Huiskes-Borghuis (Miranda)</td>
<td>+31 53 489 4605</td>
</tr>
<tr>
<td>OSIRIS/Blackboard key user</td>
<td>D. Muller (Diane)</td>
<td>+31 53 489 2681</td>
</tr>
</tbody>
</table>

*Education support*

Education support is provided by the university Student & Education Service Centre (S&O) and the Office for Educational Affairs (BOB) of the faculty. The education administration is part of the Bureau Onderwijszaken (BOZ/S&O). See also section 4.1.

EEMCS-wide coordination in the fields of Internationalization, Quality assurance, Traineeship and Study advice takes place from the BOB.
7.1.4 Facilities

PC-rooms
For practical courses the faculty of EEMCS has a number of PC-rooms available. The W-zaal (Westroom) and the flexoffice of SmartXP, situated in Zilverling/Hal A, are mainly scheduled for Electrical Engineering and Creative Technology practicals. Furthermore, in the Zilverling building rooms are situated on floor 2 (room 2042), floor 3 (3042) and floor 4 (4054) containing 12, 24 and 36 PCs respectively. During lecture hours a room assistant is present in room 3042. At night this room is open until 20.30h. After 18.00h, you can obtain entrance at the night porter at the main entrance of the Zilverling building.

Please note that near the course rooms in the Zilverling building staff rooms are situated. So please keep quiet in the building, do not use your phone in the corridors but, for example, go to the stairwell or the Educafe instead, and limit talking in the corridors. Eating is prohibited in the PC-rooms; drinking is allowed, using lockable bottles.

Year room
For first-year bachelor students of Applied Mathematics a year room is available in the Citadel building (T100); most of their training will take place there.

In the Citadel building (T300), there is also a year room available for the Creative Technology programme. Outside lecture hours this room can be used for self-study or as a project space by CreaTe students.

Smart XP Lab
In this new multifunctional area in the Zilverling building, it is possible for both parties of the faculty of EEMCS and exterior parties to conduct research in an interactive manner. The lab is a true research playground and offers ample opportunity for testing and experimenting. It is the intention that scientists from different disciplines become acquainted with each other’s fields, which may be to the benefit of their own research. This lab is, as it were, a meeting point where every possible research set-up is imaginable.

Educafe
Next to the (main) entrance of the Zilverling building, you will find the Educafe: a space where you
can study, work in groups and relax with your fellow students. There are computer workspaces and you can grab a drink or snack from the vending machines. In short: this is an ideal environment to work together on projects. On the first floor, the EEMCS student associations are situated: Scintilla (Electrical Engineering), Abacus (Applied Mathematics) and Inter-Actief (Computer Science). At present, the study association for the Bachelor’s programme Industrial Design, Daedalus, still accommodates the new bachelor’s programme CreaTe.

The Educafe also hosts two shops: IAPC and Stores. IAPC is a non-profit shop where you can turn to when you have questions about or want information on computers. Besides, you can buy laptops and all sorts of computer parts there for reasonable prices. ‘Stores’ sells components (such as resistors and capacitors) and office supplies. Furthermore, IAPC as well as Stores sells study books. Both shops are run entirely by volunteers and they are open during weekday lunch breaks for most of the year.

### 7.2 The organization of education

#### 7.2.1 Students’ Charter

As every institute for higher education in the Netherlands, the University of Twente also holds a Students’ Charter. The Students’ Charter is legally based in art. 7.59 of the Dutch Higher Education and Research Act (WHW). The Dutch text of the Students’ Charter is law-making. This means that in case of problems or conflicts you can appeal to the content of the Dutch text of the Students’ Charter (or Studentenstatuut). The Students’ Charter contains a programme-specific section (the OSS) and an institute-specific section. The institute-specific section of the Charter is at all times available in its most up-to-date form on the website [http://www.utwente.nl/studentenbalie/regelingen_statuut/charter/](http://www.utwente.nl/studentenbalie/regelingen_statuut/charter/).

If you would like to have a printed version of the Charter, it is available on request from the Red Desk: the information desk of the Student Counselling Service. For the programme-specific section of the Charter (OSS), which contains the Education and Examination Regulation (OER), please refer to the regulations and forms section on the website of your programme. [http://www.ewi.utwente.nl/en/education/](http://www.ewi.utwente.nl/en/education/)
7.2.2 Student Enrolment/Re-enrolment

Each academic year you are required to re-enrol at the University of Twente using Studielink. This re-enrolment is grafted on to the regulations in the Dutch Higher Education and Research Act (WHW) and it must be completed before 1 September. As soon as your request for re-enrolment by Studielink is received by the Central Student Administration (CSA), it will be verified whether you satisfy the conditions for enrolment. If you qualify for enrolment, your enrolment will be completed as soon as all enrolment documents have been submitted and the payment of your tuition fees is processed.

If you wish to be sure of your enrolment as from 1 September, you must complete all enrolment formalities in time – preferably before 1 August.

When your enrolment is complete, as proof of enrolment you will receive your student card and two declarations of enrolment. The declaration contains, among other things, the programme(s) and the period for which you are enrolled.

On the university level there are various student service centres, which are united in the Student & Education Service Centre (S&O). The student desk accommodates the service centres. The main services are mentioned below.

Student Services
Student Services offers various support services: you can go there to have your digital picture taken for your student card, to register, enrol or de-enrol. Student Services is situated in the Vrijhof building. See also: http://www.utwente.nl/studentenbalie/en/.

Student Counselling Service
The desk of the Student Counselling Service (the “Rode Balie”) is responsible for individual care and support of UT students at a coordinating level (besides the care educational programmes take for their “own” students). This includes for example a student psychologist, various courses (“self management”, graduating, job application) and the student counsellor.

Student psychologist
You can get help from the student psychologist when you need to talk to someone, for instance
when you experience personal problems such as problems in your relation with your parents, friends or fellow students. You do not need a referral: you can make an appointment yourself. The student psychology service aims at having the first session within a week after the student contacted them.

Student counsellor
The student counsellor offers help when you have questions about, for instance, student grants, UT financial support, switching disciplines, problems involved with switching from a school for Higher Vocational Education to University, personal problems, appeal procedures, studying abroad, studying with a disability, and entrance examination (colloquium doctum). In order to make an appointment you need to telephone the secretariat. You have to take the initiative yourself to make an appointment with the student counsellor.

The “Rode Balie” is situated in the Bastille building. For more information, go to: http://www.utwente.nl/studentenbalie/en/.

7.2.3 Communication and Information

When you want to take up a study at the University of Twente, from the very start you will be faced with various means of communication the university, the faculty and your programme use to communicate with you. As soon as your preliminary enrolment at the University of Twente is received, you will be provided with an e-mail account, user name and password. You will also be provided with some writing space of your own, where you can save your documents and where you might put your own home page. The Internet is by far the most important means of communication of the programme and the university.

E-mail
Whenever the programme or a particular lecturer wants to communicate quickly with a particular student or a small group of students, this will be done by e-mail. The Student & Education Service Centre (S&O) also uses e-mail to communicate with large groups of students. This occurs, for instance, when a lecture is suddenly cancelled or when an examination has to be rescheduled. In those situations, S&O is unable to contact the students in time through the usual channel of communication of the educational programmes, which is the Education announcement. S&O also uses e-mail to announce, for example, information sessions about study-related matters.
UT students in general have e-mail addresses like: <student name>@student.utwente.nl. In this address <student name> is replaced with a person’s initials and surname. Exceptions do occur, especially when a number of UT students have identical initials and surnames.

You can find e-mail addresses of UT students and staff on the UT website. 
Go to http://my.utwente.nl/.

MyUniversity
MyUniversity, the UT student portal, gives access to all UT data systems (OSIRIS, Blackboard). You can log on at http://my.utwente.nl/.
Besides, the portal gives access to the timetables for teaching and to some other services.

Education announcements
Changes in the timetables for teaching and examination are announced by means of an ‘Education announcement’ (Onderwijsmededeling). Every Education Announcement is spread through the Internet. The same applies for announcements concerning graduation colloquia and presentations of bachelor’s and master’s assignments. You can read them via the MyUniversity portal.

The Education announcement is the programme’s main means of communication to communicate with all of its students. It is important to check if there are any changes in the timetable every day, in order to be informed as much as possible and to prevent sitting in the wrong lecture-room at the wrong time.

Timetable for teaching activities
The portal MyUniversity gives access to the timetables for teaching activities.

OSIRIS (Student information system)
OSIRIS is the new self-service student information system which has recently been put into use by the UT. Via MyUniversity you can log in on OSIRIS using an ‘s’ plus your student number and the corresponding password. You can find a user manual on http://www.utwente.nl so/osiris/english/ Manual%20Osiris%20Student.pdf

If you have any questions, you can turn to Student Services (Vrijhof building). 
http://www.utwente.nl/studentenbalie/en/student_services/
Blackboard

Blackboard is the digital learning environment of the UT. It offers all the information you need to follow a course, such as the timetable, the contents of the lectures and additional information on the course material and the examination or assignment. Within a Blackboard site you can also communicate with fellow students and lecturers or work together on assignments.

Blackboard is a lecturer’s main means of communication to communicate with his students about a course. On this site you may also find important announcements and news items on the course.

You will need to sign up for each course you will take via Blackboard. To get access to the courses, you will need an account. After your registration at the CSA, the ICTS will usually provide you with a user name and password, the so-called ICT account, which you will receive by letter within 10 workdays.

If you were not provided with an ICT account or if you lost your password, please report this at the ICTS servicedesk, located at Horstring W122 (icts.servicedesk@utwente.nl, phone number +31 53 489 5577) and keep your student card at hand.

If you have any questions on Blackboard or OSIRIS, within the faculty you can turn to S&O, Diane Muller, the Zilverling building, room A104, phone +31 53 489 2681.


7.2.4 Student card

The student card issued by the University of Twente is valid proof of identity within the UT and it is also a proof of enrolment. You are required to show the student card at request when making use of university facilities such as attending lectures, taking examinations, or visiting libraries. You will receive your student card and two declarations of enrolment through the post as soon as you are registered. So please see to it that the Student Administration (CSA) has your correct address.

Uses of the student card:

• Student card
  The card is a valid proof of enrolment for the academic year 2010-2011.
• Library pass
  The student card barcode enables the card to serve as a library pass.

• Xtra card
  If you want to make use of the sports and cultural facilities in Enschede via http://www.xtra-card.nl/en, the card serves as Xtra card as well. See http://www.xtra-card.nl/en.

Declaration of enrolment
With a declaration of enrolment you can prove your enrolment (for instance to get a student grant or at your insurance company). The declaration contains, among other things, the programme(s) and the period for which you are enrolled.

Theft/loss
In case of theft or loss of the card, you can apply for a new student card on payment of EUR 5.- at the Student Services desk in the Vrijhof building.

No student card yet?
If your enrolment has not yet been fully completed, no student card will be produced. In addition to your enrolment the CSA requires a digital photograph. On workdays between 09.00 and 17.00h you can have your picture taken at the Student Services desk in the Vrijhof building (room 239B), across the library.

7.2.5 Year’s schedules
The year is divided into two semesters, each of which is divided into two quarters. Most courses will take one quarter and will be completed in the same quarter, mostly through a written examination.
In every quarter 15 ECTS-credits are scheduled. The quarters run as follows:
• Quarter 1 from week 35 (30 August 2010) until week 44 (7 November 2010)
• Quarter 2 from week 45 (8 November 2010) until week 04 (30 January 2011)
• Quarter 3 from week 05 (31 January 2011) until week 15 (17 April 2011)
• Quarter 4 from week 16 (18 April 2011) until week 26 (03 July 2011)

For the exact schedule of courses see the timetables on the website http://myutwente.nl/ut/.
For a brief summary in English: [sumber](http://www.utwente.nl/so/roosterwerkgroep/jaarcirkels/jaarcirkels.doc/summary_in_english.html)
7.2.6 Lectures

The lecture hours have been altered as of the last academic year 2009-2010. This resulted in identical lecture hours on a 3TU level at all three institutes. This facilitates the exchange of education between the 3TU institutes by means of real time video conferencing.

The new lecture hours fit in very well with a very simple and straightforward model: all lecture hours start at a quarter to the hour and end at the half hour.

There are fifteen-minute breaks between lecture hours, lunch and dinner breaks last 75 minutes. Starting times of written examinations fit in with this schedule. The longer breaks between the morning and afternoon lectures and the afternoon and evening lectures respectively, are included in a consecutive numeration.

<table>
<thead>
<tr>
<th>Period</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st period:</td>
<td>08:45 - 09:30</td>
</tr>
<tr>
<td>2nd period:</td>
<td>09:45 - 10:30</td>
</tr>
<tr>
<td>3rd period:</td>
<td>10:45 - 11:30</td>
</tr>
<tr>
<td>4th period:</td>
<td>11:45 - 12:30</td>
</tr>
<tr>
<td>5th period = lunch break:</td>
<td>12:45 - 13:30</td>
</tr>
<tr>
<td>6th period:</td>
<td>13:45 - 14:30</td>
</tr>
<tr>
<td>7th period:</td>
<td>14:45 - 15:30</td>
</tr>
<tr>
<td>8th period:</td>
<td>15:45 - 16:30</td>
</tr>
<tr>
<td>9th period:</td>
<td>16:45 - 17:30</td>
</tr>
</tbody>
</table>

7.2.7 Taking courses

You will need to sign up for each course via Blackboard. To get access to the courses you require an account. The ICTS will provide you with a user name and password.

7.2.8 Knowing your way on campus

All of the faculty of EEMCS teaching takes place in rooms situated in buildings which are spread all over campus. In the time tables the lecture rooms are indicated using a code in which the first two letters indicate the building where the room is situated. The list below contains the most frequently
occurring abbreviations of buildings. The computer practicals generally take place in one of the Zilverling rooms.

CU Cubicus
CR Carré
HO Hogekamp
HR Horstring
HT Horsttoren
LA Langezijds
RA Ravelijn
SC Sportcentrum
SP Spiegel
VR Vrijhof
WA Waaier
ZI Zilverling

For a map of the University of Twente see the next page or http://www.utwente.nl/media/28498/campusmap-eng.pdf
Bezoekadres:
Drienerlolaan 5
7522 NB Enschede

Postadres:
Universiteit Twente
Postbus 217
7500 AE Enschede

tel: +31 53 4899111
fax: +31 53 4892000
e-mail: info@utwente.nl
7.2.9 Study material

Textbooks, lecture notes, readers or syllabuses are required for virtually every course. For those you can turn to the student association and the UnionShop.

The lecture notes, readers and syllabuses will be sold from the beginning of every semester at the UnionShop. You can check the website to see if they are in stock: http://www.studentunion.utwente.nl/en/.

7.2.10 PC-prive scheme for UT students and PC, laptop and printer purchase

As a student you are entitled to take part in a special subsidized PC purchase scheme (referred to as the PC-prive scheme) offered by the UT. You can take part in this scheme cheaply with an interest-free loan. Every regular full-time student enrolled at the UT can take part in the PC-prive scheme as follows.

Principal requirement:
Once in the bachelor’s phase and once in the master’s phase, provided the student in question is 60 ECTS-credits or more away from the degree in the respective phase.

Exceptions:
1. When attending a one-year master’s course, the student may sign up for the scheme no later than one month after the beginning of the programme;
2. Students enrolled in a bachelor’s programme who take courses in the bachelor’s phase as well as in the master’s phase and who still have to attain at least 60 ECTS-credits for both phases taken together are also entitled to take part in the scheme. Taking part in the scheme is then regarded as taking part during the master’s phase.

Note: this also includes students entering a programme via an alternative route who are attending a so-called ‘bridging programme’.

As a UT student you can purchase a high-quality PC and communication equipment in the IT shop at a highly competitive price. The University of Twente will lend you a maximum of EUR 1,362.- interest-free, which is to be repaid in a number of monthly instalments.

Whether the student is required to repay the loan in 12 or up to 24 months depends on the
remaining duration of the course. If the remaining study duration is 12 months, the loan has to be repaid in 12 months. A graduated calculation related to the remaining duration of the course may mean that the repayment term is longer.

Via the Notebook Service Centre general UT software (such as Maple, Virusscanner, SPSS) can be downloaded. Special software may be available via your faculty.

For more information on the PC-privé scheme, refer to:
http://www.utwente.nl/studentenbalie/regelingen_statuut/charter/appendix_57_pc_privet_scheme_fo.html

7.2.11 Examinations

At the start of the academic year, for every student a timetable of teaching activities and examinations is available. This timetable shows, among other things, the weeks in which examination are held (see also section 2.5). The timetables for teaching are also available on the websites of the programmes. Any changes, such as, for instance, the examination dates, will be announced via the Blackboard sites of the courses concerned and through Education announcements. So no new timetables will be distributed among the students if any changes might occur.

For the sake of students’ and teachers’ clarity the starting time of written examinations is identical to the first morning or afternoon lecture respectively. So:
• morning examinations start at 08.45h
• afternoon examinations start at 13.45h

Timetables of examinations are available via: http://my.utwente.nl/.

General rules
1. The student himself is responsible for registering or deregistering for the examinations.
2. Twice a year students are given the opportunity to take written and oral examinations belonging to a particular educational unit. Practical training can be completed at least once a year. The rules that apply for practical training will be communicated at the start of the educational unit.
3. The student who has not gained a mark 6 or higher after two markings by an educational
unit and who still wishes to gain such a mark, is to appeal to the examination board for
permission to take another examination in the educational unit concerned. This appeal must be
accompanied by a working plan drawn up by the student in consultation with the examiner of
the educational unit concerned and the study advisor. The examination board will decide on
the appeal.

4. On the authority of the examination board at least one month before the start of the semester
the timetable of examination of that semester will be announced, in which dates and times of
the examinations are fixed.

5. The examination board may give permission to deviate from the number of times an
examination will be held and the way in which examinations can be taken.

6. Rescheduling an examination to a time different from the one indicated in the timetable is only
permitted after the examination board’s consent.

7.3 UT regulations

7.3.1 Studiefinanciering (Dutch student grant)
The contribution of the Dutch government towards the cost of education is called studiefinanciering.
It consists of either a conditional grant plus an additional loan (the so-called blended
studiefinanciering), or just a loan. The grant of IBG (Informatie Beheer Groep, the government
institution responsible for the Dutch student grants) allows students to receive part or all of their
training outside the Netherlands. The entitlement to studiefinanciering depends on your first year of
enrolment. In any case, you have to be enrolled as a student and you should not be over 30.

7.3.2 Transitional arrangements
If courses are radically changed or if they are cancelled, at the beginning of the academic year you
will be informed in writing about the consequences which this entails.

7.3.3 Guarantee Grant
The ‘Regulation Guarantee Grants First-year Students’ is meant for students who start an educational
programme at the UT from VWO (Dutch pre-university secondary education) and who make
a serious effort for the educational programme. If such a student decides to discontinue his educational programme before 1 February of the first year of study at the UT, the UT offers the opportunity to start a new educational programme with only limited loss of studiefinanciering possibilities (with as many equal opportunities as possible). The background of this regulation is that a lot of VWO students who would make good university students tend to choose for Higher Vocational Education nonetheless because they are under the impression that they will run less financial risk doing so.


7.3.4 Regulation graduation support

Students at the UT with certain special circumstances can make use of the Regulation graduation support. Students can appeal to this regulation when they have run into a delay due to recognized special circumstances during a period of blended studiefinanciering. The blended studiefinanciering concerns the period for which the studiefinanciering can partially be converted to a gift; in other words: the period in which the student is entitled to the basisbeurs (basic grant). To apply for graduation support you can contact the student counsellor in the Bastille building.


7.3.5 Top-level sport

Combining university-level studies and top-level sport can be problematic for many students. It generally proves impossible to postpone either academic studies or a career in sport until later; both activities require the practitioner to achieve results within a relatively short period of time. The UT is aware of the problems involved and has developed a policy covering the practice of top-level sport.

See also: http://www.utwente.nl/studentenbalie/regelingen_statuut/charter/appendix_53b_support_scheme_for.html and http://www.utwente.nl/studentenbalie/en/scs.doc/

7.3.6 Regulation encouragement student activism

Within the framework of encouragement of student activism there is a special regulation for active students. This involves the individual readjustment of educational obligations for active students, in order for them to have more flexibility in their studies and so that they will run into less delay
because of their activism. If you want to know if you qualify for this regulation or if you want more information, go to: http://www.utwente.nl/studentenbalie/regelingen_statuut/charter/.

7.3.7 Studying with a disability

Being disabled, following an educational programme is not always easy. However, the UT makes a serious effort to enable the disabled to study. Physically or sensory disabled students or dyslexic students are given the opportunity to take examinations in a way that is tailored to the requirements of their personal disabilities as much as possible. Students who fall under this regulation have been brought to the attention of S&O/BOZ and the EEMCS lecturers concerned through a letter of the study advisor.

See also: www.utwente.nl/studentenbalie/rode_balie/handicap and http://www.onderwijsenhandicap.nl/

In general, being disabled, it may be wise to talk to the student counsellors and the study advisor of the faculty before the start of your studies. This may prevent any disappointments.

7.4 UT facilities

7.4.1 Educational Affairs Office EEMCS

The Educational Affairs Office (BOZ, Bureau Onderwijszaken) of the faculty of EEMCS is part of the Student & Education Service Centre (S&O) and assists the faculty in registering study results, supervising the (individual) students’ study programmes, organizing everything surrounding final assessment, making timetables, organizing examinations and organizing administrative systems.

BOZ is situated on the ground floor of the Zilverling building, room A104-A116. You can turn to them with most of your practical questions. They are reachable by telephone number +31 53 489 3794 or by e-mail boz@ewi.utwente.nl.

In addition to this, you can turn to Student Services on the first floor in the Vrijhof building with any questions concerning education.
7.4.2 UnionShop
The UnionShop is situated on the ground floor in the Bastille building. The UnionShop sells lecture notes, readers and syllabuses. It also runs a copy service. In the self-service section not only copies can be made, but also reports can be bound, flyers cut, etc.

7.4.3 Notebook Service Centre
Nowadays, a notebook is virtually indispensable to any student at the University of Twente. You require your notebook to communicate with others, to collect information, to make calculations and drawings, to perform simulations and even to take examinations.

Are you planning to buy a notebook in July or August? Every year in the summer, the ICTS Notebook Service Centre of the UT selects notebooks which most assuredly will meet the requirements of your educational programme!

For more information, go to: http://www.utwente.nl/icts/en/nsc/

Service desk
All students and university staff members can turn to the ICTS Service desk if they have problems or questions in the field of ICT. The ICTS Service desk is open from 08.30 until 17.00h and is reachable by telephone number +31 53 489 5577.

The service desk is situated in Horstring W122 (next to the Notebook Service Centre). With ‘general’ questions on ICTS you can turn to icts.servicedesk@utwente.nl. For more information, go to: http://www.utwente.nl/icts/en/servicedesk/.

7.4.4 Library/information specialist EEMCS
The central library of the University of Twente, situated in the Vrijhof building, contains books and journals on a number of disciplines. In addition, it contains study facilities such as study places in the reading rooms, quiet study places, working areas and PC work areas. The University Library catalogue, which includes the faculty libraries and the central library, is available online (www.utwente.nl/ub). Here you can also consult the catalogues of all Dutch University Libraries.

You need a student card if you want to lend publications or if you want to make use of the study
facilities, for the student card serves as a library pass. Further information on lending or ordering publications is available at the desk of the library. The University of Twente is working on the accessibility of scientific journals. More and more journals can be consulted through the Internet.

The opening hours of the central library are from 08.30 until 22.00h on workdays, and from 11.30 until 16.30h on Saturdays (for study purposes only, during examination periods). The information desk is open from Monday to Friday from 08.30 until 17.00h. You will find more information on www.utwente.nl/ub.

The University of Twente has a team of information specialists who offer support in the purchase of books, provide information on how to use the (digital) library and how to find scientific information on research and education for both staff and students.

For EEMCS, the information specialists are:
- Mrs drs. P. (Petri) de Willigen, Citadel building H203, phone +31 53 489 2085

7.4.5 Student restaurant

In the Waaier building, the student restaurant of the UT is situated. The restaurant is based on the so-called free-flow system, which means that at various free-standing points of distribution a broad assortment is offered. Here you can get a hot day’s menu, the Dagmenu. You can also choose to have the more luxurious menu, or select from a broad assortment of sandwiches, rolls, snacks, desserts and hot and cold drinks.

7.5 Student activism

Organizing various activities requires qualities and skills which you may benefit from for the rest of your life. So being active in an association (being on a committee or a board) will always beneficial to your CV. In the professional field, surely students will be watched for who did more than just study.
Being active also helps you getting introduced to people you might never meet otherwise. Moreover, board members often have a specific position, such as chairman, secretary or treasurer. Positions like this will teach you how to draw up an agenda, to chair meetings, to take minutes or, for instance, to draw up an estimate.

**Student associations**
Every educational programme has its student association. They all organize all sorts of study-related activities, such as lectures, excursions and conferences. But also recreational activities are laid on, such as get-togethers and parties. In addition, the student association for instance takes care of the book sale.

The student association for Electrical Engineering is Scintilla, for Creative Technology, it is (for the time being) Daedalus, Abacus is the student association for Applied Mathematics and Inter-Actief for Computer Science.

**Student participation and other committees**
Within the faculty of EEMCS you may become a member of various committees, such as:

- **The Faculty Council**
  See also the first page of this appendix.

- **Programme Committee**
  See also chapter 5.

- **Support Committee for Programme quality**
  See chapter 5.
## Cursusaanbod

### Kerngegevens

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