UNIVERSITY OF SOUTHERN DENMARK

Chapter 9

The programme specific part of the curriculum for:

Bachelor of Engineering in Interaction Design

Curriculum 2012, Version 1.2

Applicable to students admitted September 2012 onwards

The curriculum is divided into general provisions (Chapters 1-8), a programme specific part (Chapter 9) and the module descriptions for the subjects studied for each programme. Students

should familiarise themselves with all three parts in order to acquire a full overview of the rules that apply throughout the study programme.

§1 Job Profiles

Interaction Design is a unique combination of industrial design and engineering. The graduate has particular competitive skills, as he/she:

- Masters the many aspects of the design process through the entire course of development
- Understands to emphasize the users
- Seeks holistic and realisable solutions
- Is capable of using the technical opportunities to the benefit of the users
- Understands to include economic and market-related aspects in the final solution

These core competencies give wide job opportunities:

- Design projects
- Product development
- Customer/market analyses and sales
- Strategic projects with customer segmentation and product portfolio
- Link in the team work from customer to development, manufacture, delivery and service
- Consultancy

The study programme highlights mechatronic products; still there are job opportunities within other fields.

§2 Educational Competencies

The objective of Interaction Design is to educate engineers who are able to contribute to design and development of innovative, user oriented and interactive products, emphasizing human beings.

The most important skills of a BEng in Interaction Design are:

1. To understand the overall interaction between individuals, technology, ethics and society.

2. To apply one's creative resources, innovative thinking and aesthetic sense and interest for general human aspects in order to influence design and development of products able to enrich and improve the daily life of others.

3. To be able to design products or services which consider interhuman collaboration; expressing a functional and relevant aesthetic reflection of current ethical, social and cultural trends and contexts.

4. To design, apply and integrate theory and methodology from a number of disciplines in the development of innovative, interactive and user oriented products and concepts.

5. On the basis of relevant technological and scientific prerequisites to become capable of choosing and integrating concepts and technology from different fields throughout the design process; including manufacture of a prototype.

6. To design products and services which are both innovative and market-oriented. To become capable of weighing market and production potentials, and cost issues regarding products and concepts.

7. To maintain a clear and varied view on a design project, incorporating both personal and interhuman aspects while discussing input from all the involved parties; and based on this currently develop syntheses to improve the continuous design process.

8. To improve and amend one's academic skills, personal development and design interpretation based on an on-going process of self reflection and interest in the technology development of tomorrow.

The Academic Competencies focus on:

Mastery of the design process

It is important to work out of a holistic approach with emphasis on the human being throughout the design process towards an innovative, user oriented product. The holistic approach is trained all the way throughout the study programme.

User-centred design:

To design quality of life for the user requires a great insight in the physical and psychical needs of the human being. Therefore, emphasis is put on knowledge of the human physiology, senses and interaction with technical products. This knowledge is to be applied in user surveys to understand the users' needs, and to interpret their feedback.

Mechanical product development

Design of mechanical remedies able to be linked to the human ergonomic capacity is emphasized. Hereby, an understanding is achieved of the entire course of development; from idea to user survey, sketching, choice of material, design and finally manufacture of a prototype.

Development of intelligent electronic products

In electronic products, design of products able to be linked to the human senses is brought into focus. This provides an understanding of the entire course of development from idea, user surveys, electronic measuring systems, circuit theory, and choice of components and up to a functional laboratory model. In intelligent products, the user's interaction with the product's user interface (software) is emphasized in particular.

Society and market

It is important to integrate social -and market conditions in the design process. Here, the company's organisation and management is emphasized together with business principles, market awareness and strategic marketing.

Possibility of competency profiling

The competencies can be strengthened by choosing optional courses in semesters 4 and 5 (15 ECTS) within the profiles design process (design skills), user oriented product development (engineering skills) or marketing/business (skills in social sciences).

§3 The Academic Blocks of the Programme

The qualifications of the Interaction Design engineer are built up by students working with topics from 6 academic blocks. The academic topics are linked together in the individual semesters by semester themes.

The design process:

- Idea- and concept development
- Models & prototypes
- Design as collaborative process
- Team processes/management
- Storytelling in business
- Negotiation
- User involvement:
    - user workshops and communication
    - testing of ideas with users
    - analysing and understanding the users' needs
- Interactive sketching:
    - Communication of concepts and ideas to others
- Ethnographic studies:
    - studying/understanding the users
    - Interviews, videos
- Form and semantics:
    - perception, aesthetics and use of colours, materials and surfaces
- Creative visualisation:
    - sketching techniques
    - 3D sketches
    - view models
    - photos and posters

The human being

- How do people act, interact, react and communicate
- Interaction
    - the interaction between people and technique
    - the interaction between products
- Ergonomics
    - the performance/capacity of the body
    - motor function
    - quality of life for the user
- Human perception
    - sensory impact as driving force in interaction design
- Human Computer Interaction
    - mental models
    - memory and attention
    - understanding human interaction and digital devices

Mechanical product development

- 3D modelling
- Technical documentation
- Materials and processes, properties and choice
- Mechanical computation – stress-strain theory
- Design elements
- Analysis of mechanical systems

- Production-friendly design
- Rapid prototyping
- Mathematical tools

Intelligent electronics product development

- Analogue electronics
- Circuit theory
- Electronic components
- Computer simulation
- Programming
- Digital technique
- Microcontroller systems
- Embedded systems (hardware and software)
- Mathematical tools

Society and market

- Understanding technology
- Understanding management
    - Players and stakeholders of the company
    - Organisation and management
    - From idea to customer
- Marketing
    - Product policies
    - Market and competitors
    - Strategic marketing
    - Consumer- and business to business market

Personal and learning skills

Personal skills:

- Commitment
- Initiative
- Responsibility
- Ethics
- Culture
- Ability to put own learning into perspective

Learning skills:

- Picking out, collecting, analysing and assessing data material
- Dissemination of working results under working methods requiring reflection, co-operation and independence

§4 Survey of Semester Themes

Semester	SEMESTER THEMES
7.	**Final Project**
6.	**Engineering Internship**
5.	**Product Concepts – Experts in Teams**
4.	**Intelligent Interaction – Bytes and Brains**
3.	**Electronic Interaction and Sensors– Sensors and Senses**
2.	**Mechanical Interaction and Actuators – Muscles and Motors**
1.	**Discovery: User-Centred Design Process**

§5 Survey of Semester Modules

Semester	STRUCTURE																										
7.	**IMPROJ** **Final Project**																										
6.	**IDINGPR** **Industrial Engineering Training**																										
5.	**EXS5** **Experts in teams**													**FOS5ID** **Form and Semantics**					**Optional**						**Optional**	
4.	**CSB4ID** **Concept Design of Product with Software-Based User Interfaces**																		**EMB4** **Embedded Systems 4**						**Optional**		
3.	**ECD3ID** **Electronic Concept Design**													**EMB3** **Embedded Systems 3**					**SENS3** **Sensors and Electronics**								
2.	**MCD2ID** **Mechanical Concept Design**																		**IMBAM2M** **Basic Mechatronics**								
1.	**IDUCP1** **User-Centred Design Process**																										
ECTS POINTS	1																										1

§6 Description of Semester 1

SEMESTER THEME:

”Discovery: User-Centred Design Process”

Through technical elements and a number of projects, students are provided with basic tools for the rest of the programme and an overview of the entire interaction design field.

VALUE ARGUMENT:

It is important for new students to quickly get an insight into the professional competency of the programme, as well as the working methods of the user-centred design process.

In 5 sub-projects we work on design tasks providing an overview and comprehension of the correlation between user surveys, interaction analysis, understanding technology and management and the design process in concept developments.

COMPETENCY GOALS:

Students must be able to:

- understand the overall correlations in a design process of concept developments
- carry out ethnographical user surveys
- analyse human interaction with technological products
- comprehend the function of products, and evaluate technological possibilities
- carry out a business analysis and understand business concepts
- choose methods and tools in a design process
- carry out a concept development along with designing a part for a mechanical product
- choose materials and processes, as well as make mechanical calculations of a sub-product
- contribute in the teamwork and, evaluate and develop their own learning process

SEMESTER STRUCTURE:

IDUCP1 – User-Centred Design Process (30 ECTS)

The module is obligatory and constitutes the first year examination.

CONTEXT:

The module IDUCP1 provides an understanding of the working methods in a user-centred design process with focus on the users’ needs and interaction with technological products. Through 5 sub-projects, we work on design tasks incorporating user surveys, interaction analysis, comprehension of technology and management, design, choice of materials and processes, as well as mechanical calculations. The work is completed with a concept development including all sub-elements of the semester.

§7 Description of Semester 2

SEMESTER THEME:

”Mechanical Interaction and Actuators – Muscles and Motors”

Emphasis is put on design of mechanical remedies able to be linked to the human ergonomic capacity. We work on user interaction with mechanical systems.

VALUE ARGUMENT:

It is important to design mechanical systems in balance with the physical performance of individuals and the user’s interaction with the product. Thus, teaching in ethnographic user testing and ergonomics is integrated with a project in concept development of a dynamic mechanical system supporting/training a body movement.

COMPTENCE GOALS:

Students must be able to:

- understand the links between the physical/ergonomic performance of the human being and mechanical systems.
- carry out ethnographical user surveys and hereby analyse the user’s needs and interaction with mechanical products.
- analyse ergonomic issues, and design mechanical suggested solutions
- develop and design a concept solution for a user-friendly, dynamic, mechanical system
- design, calculate, and provide documentation of a dynamic, mechanical system.
- present test models and prototypes for user testing
- solve electromagnetic problems

SEMESTER STRUCTURE:

MCD2ID – Mechanical Concept Design (20 ECTS)
IMBAM2M – Basic Mechatronics (10 ECTS)

Both modules are obligatory.

CONTEXT:

The module MCD2ID provides an understanding of the coherence between the physical/ergonomic performances of the human being; the user’s needs, and design of mechanical systems. Through project work, we work on design and concept development of a user-friendly, dynamic, mechanical system supporting/training a body movement.

The module IMBAM2M (Basic Mechatronics) provides the background for the design of mechanical systems, particularly the theoretical angle in terms of the associated mechanics, mathematics and physics.

§8 Description of semester 3

SEMESTER THEME:

"Electronic Interaction and Sensors – Sensors and Senses"

Emphasis is put on the comprehension of design of electronic systems able to be linked to human perception. We work on concept development of electronic systems and sensors able to support, replace and affect human perception.

VALUE ARGUMENT:

It is very important to understand and find the potentials of the interaction between human perception and electronic systems/sensors. Thus, teaching in electronic systems and sensor techniques is integrated with courses in human perception.

COMPETENCE GOALS:

Students must be able to:

- understand analogies and the interaction between human perception and electronic systems/sensors
- analyse and dimension electronic systems and sensors/actuators
- complete a design project from user survey to evaluation of prototype
- develop and design a concept solution for an electronic system/sensor, able to measure a condition that involves human perception
- design and evaluate a working laboratory model

SEMESTER STRUCTURE:

ECD3ID – Electronic Concept Design (15 ECTS)
SENS3 – Sensors and Electronics (10 ECTS).
EMB3 – Embedded Systems 3 (5 ECTS)

All three modules are obligatory.

CONTEXT:

The module ECD3ID provides an understanding of the connection between human perception and needs, and design of electronic systems. Through project work, we work on design and concept development of an electronic system/sensor able to measure a condition that involves human perception. The module EMB3 provides the students with knowledge and skills to develop smaller embedded programs in a high-level language. The module SENS3 comprises electronics, sensors and actuators. Emphasis is put on the ability to analyse and dimension electronic systems/sensors.

§9 Description of Semester 4

SEMESTER THEME:

"Intelligent Interaction – Bytes and Brains"

Emphasis is put on the comprehension of design of intelligent products with software-based user interface. We work on the user's complex interaction with these intelligent products.

VALUE ARGUMENT:

It is important to achieve the ability to analyse and understand the user's complex interaction with intelligent products. Having this knowledge, you can see the potentials, and design a user-friendly interaction and operation of these products.

Thus, teaching in microcontroller and embedded systems is integrated with "Human Computer Interaction" which builds on insight in human psychology.

COMPETENCE GOALS:

Students must be able to:

- comprehend human perception, mindset and response to signals from the outside world; when alone or in social contexts.
- analyse and explain the interaction between people and digital products
- analyse and design hardware and software for electronic products
- complete a design project from user survey to evaluation of prototype
- develop and design a concept solution for an electronic product with a software-based user interface
- design and evaluate a function model

SEMESTER STRUCTURE:

CSB4ID – Concept Design of Product with Software-Based User Interfaces (20 ECTS)
EMB4 – Embedded Systems 4 (5 ECTS)
Elective courses equivalent to 5 ECTS

Module CSB4ID and EMB4 are obligatory.

CONTEXT:

The module CSB4ID provides an understanding of the user's complex interaction with intelligent products. Through project work, we work on concept development and design of a software-based human machine interface.

The module EMB4 provides the students with the ability to analyse and design digital systems, as well as to understand the user's interaction with these

§10 Description of Semester 5

SEMESTER THEME:

”Product Concepts – Experts in Teams”.

Emphasis is put on achieving a holistic understanding of product concepts seen from both the user’s, the manufacturer’s and the investor’s point of view. We work on realisable product concepts from an external proposer.

VALUE ARGUMENT:

It is important to find the balance between the different requirements of the design process: Interaction, form, surface characteristics, materials, technological potentials, production technology and marketing. Thus, teaching in form, color and manufacture is integrated with ”Co-design” – players of the design process. Furthermore, students must acquire experience in completion of project work in an innovative and entrepreneurial context. The project work is organised in a virtual company, and students must go through all the developments steps – from idea to manufacture of a fully working prototype; considering finances, external suppliers etc.

COMPETENCE GOALS:

Students must be able to:

- analyse, understand and communicate the interaction, form, expression, communication potentials and values of an interactive product
- design product concepts and relate alternative solutions to the requirements of technology, manufacture and marketing
- comprehend fundamental principles of teamwork and collaborative design processes
- plan and facilitate activities that encourage collaborative design and iterative courses of development
- plan and organise, manage and complete a cross-functional project in co-operation with engineering students from other programmes, and external players
- establish professional, external relationships, and plan their own career opportunities
- apply research methods when solving new problems
- understand the philosophic aspects of natural science, taking as their starting point specific scientific methodical activities in the projects.

SEMESTER STRUCTURE:

EXS5 – Experts in Teams (15 ECTS)
FOS5ID – Form and Semantics (5 ECTS)
Elective courses equivalent to 10 ECTS

Modules EXS5 and FOS5ID are obligatory.

CONTEXT:

The module EXS5 provides an understanding of design as an all-encompassing process with integration of: The individual, interaction, technology, manufacture, marketing, business, ethics and society. We focus on applying research and scientific methodology when solving new problems. The interdisciplinary co-operation with other engineering students provides an experience in planning, organizing, controlling and accomplishing a project with many players.

The module FOS5ID covers form and semantics. Emphasis is put on the ability to assess interactive product's interaction, form, expression and communication possibilities.

§11 Description of Semester 6

SEMESTER THEME:

”Engineering Internship”.

Focus is put on practical training of competencies and an advanced business understanding.

VALUE ARGUMENT:

The students’ abilities are improved by taking part in the company’s projects; and thus train the acquired theory and project procedures. Co-operation and networking with industrial companies open doors for finding a final project and maybe also the first job.

COMPETENCE GOALS:

To expand on the students’ business understanding, develop their creativity, independence and interpersonal skills; and to provide students with more of the following competencies:

- Ability to transform the theoretical core areas of the programme into practical and feasible projects.
- Competency requiring that new knowledge is acquired to carry through projects.
- Comprehension of a company’s organisational, economic, social and work-related conditions.
- Knowledge of a company’s social and executive environment (communication and co-operation among employees at different level; as well as rules and clerical routines).
- Skills in presenting working results both orally and in writing; in forums of different level.

SEMESTER STRUCTURE

IDINGPR – Industrial Engineering Training (30 ECTS)

The module is obligatory.

§12 Description of Semester 7

SEMESTER THEME:

"Final Project".

Focus is put on problem-based project work linked up to the principal subjects of the programme.

VALUE ARGUMENT:

The final project must reveal an independent, experimental or theoretical discussion of a practical problem linked up to the principal subjects of the programme. The student is trained in professional problem-solving in co-operation with an internal supervisor and an external supervisor from industry.

COMPETENCE GOALS:

The final project must demonstrate the student's ability to independently describe, analyse and build up solutions for practical engineering problems. The student must prove skills in:

- translating technical research results; and scientific and technical knowledge into practical application by means of development tasks and solving technical problems
- having a critical and reflective approach to experiences from the internship.
- critically acquiring new knowledge within relevant engineering areas and hereby independently solve engineering problems
- drawing in social, economic, environmental- and working consequences when solving technical problems
- attending executive- and co-operative relations with people of different educational and cultural background
- putting into perspective the project's results to a broader target group.

SEMESTER STRUCTURE

IMPROJ – Final Project (30 ECTS)

The module is obligatory.

§13 Entry into force and amendments

1. Approved by the Academic Study Board of the Faculty of Engineering on 16th June 2010.

   Approved by Director of Studies on behalf of the Dean of the Faculty of Engineering on 7th July 2010.

2. Curriculum 2012 approved by the Academic Study Board of the Faculty of Engineering and by Director of Studies on behalf of the Dean of the Faculty of Engineering on 7th March 2012 (Version 1.0).

3. Amendments approved by the Academic Study Board of the Faculty of Engineering and by Director of Studies on behalf of the Dean of the Faculty of Engineering on 14th November 2012 (Version 1.1)

4. Amendments approved by the Academic Study Board of the Faculty of Engineering and by Director of Studies on behalf of the Dean of the Faculty of Engineering on 18th April 2013 (Version 1.2)