DSMI

The Engineering Education Model of the University of Southern Denmark[1]

23 February 2015

[1] In Danish *Den Syddanske Model for Ingeniøruddannelser* (DSMI)

Introduction

This document describes the Engineering Education Model of the University of Southern Denmark (DSMI).

DSMI was developed in conjunction with the establishment of the Faculty of Engineering at the University of Southern Denmark (SDU). The model is based on comprehensive experience in the field of education that focuses particularly on engineering education. This experience derives from activities at SDU and at Odense University College of Engineering, which was merged with SDU in 2006.

DSMI has been applied in all SDU's BEng, BSc in Engineering and MSc in Engineering programmes since 2006 and is based on activating teaching and active learning. The model is regularly updated in step with developments of educational methods and changes in the regulations applicable to university programmes.

The purpose of DSMI is to establish a clear joint foundation for engineering programmes at the University of Southern Denmark with a distinct, outstanding profile that meets current demands. The purpose of the model is to signal clearly that the region of Southern Denmark has a highly effective engineering study environment that produces the competent, well-qualified engineers that are in demand in the business community.

DSMI is implemented in accordance with SDU's underlying educational principles (activating teaching and active learning) and SDU's quality assurance policy for education that includes eight subsidiary policies for educational quality.

This document is subdivided into three main sections: section 1, which describes the engineering profiles and competencies that the education model will give rise to; section 2, which describes the selected framework and structure for the implementation of the model for individual engineering programmes; and section 3, which describes the model's learning environment.

Section 1: The DSMI profile and engineers' competencies

1.1 Challenges

Regional competence boost
The labour market and public and private enterprises in Southern Denmark have a growing need for a regional collaborative partner for research and education in the field of science and technology – a partner in education that will at all times meet the current and anticipated needs of the business community and, at the same time, contribute to innovation in existing and in future enterprise. The Faculty of Engineering at the University of Southern Denmark is this regional partner in education. The faculty intends to help to provide a general boost to competency in the field of science and technology, thereby enhancing the region's overall knowledge-based competitiveness.

National profile
Engineering programmes at the University of Southern Denmark have their base in the Danish tradition for practical and applied engineering programmes with high academic standards combined with a culture of innovation focusing on collaboration and problem-solving. This is reflected both in the educational model selected and in the educational methods applied.

Global perspective
The highly qualified workforce of tomorrow must be able to master a global perspective. As an engineer it will be important to be able to work within an international framework while remaining part of local, regional and national labour markets.

1.2 Profile

Engineers working within a context
The generation and utilisation of knowledge is a central element in the continued development of society. In the field of science and technology, engineers occupy a key position in this process because they exert substantial influence on which technical knowledge is developed and on how it is applied. It is crucial, therefore, that engineers possess technical skills and competency and understand, respect and act in accordance with the task context. The systematic development of scientific and technical knowledge in an applied context is, therefore, central to DSMI.

Knowledge-sharing and networking
In the future, there will be a need for ever more efficient knowledge-sharing between the institutions whose objective is to generate new knowledge and the business community that makes its living by converting knowledge into societal values. For this reason, DSMI focuses on establishing effective knowledge-sharing through healthy and sustainable collaboration between the faculty and

the business community. The collaboration is based on common R&D projects, student projects, engineering internships and reciprocal staff exchanges.

Initiative and responsibility
Denmark's future development and economic growth will depend substantially on engineers capable of playing their part in actively maintaining and further developing an existing company and its business area, or alternatively in setting up a new company. An important criterion for success in engineering study programme is, then, that its graduate engineers are qualified and prepared to actively participate in and share responsibility for the development of a company to which they are attached. Accordingly, DSMI has been developed with a focus on an educational environment where the success of the student is linked to his/her own initiative and accountability.

Competency profile must correspond with supply and demand
Close, forward-looking dialogue between engineering programmes and the business community regarding the continued development of the engineering study programmes is crucial for the continued development of such programmes. This means that there will be a continuous, proactive development of study programmes' competency profiles in close dialogue with the business community.

Individuality and globalisation
Two prevailing currents in the development of society are individualisation and globalisation.

Within the educational system, it is important to give individual students the opportunity and the desire to exploit and develop their creative talents to the utmost. DSMI establishes a sphere of learning where students will see themselves as both an individual and a team player in a sphere of learning that allows the individual to be technically and creatively challenged in close collaboration with fellow students and teachers.
With the increasing globalisation of engineering workplaces, the ability to work in an international, cross-cultural setting is of considerable importance to the individual engineer and to the business community in general. DSMI establishes a study environment where as an integral part of the study programme the student acquires international contact and experience in cross-cultural teamwork.

1.3 Engineering competencies

1.3.1 Core competence of programmes
All engineers from the University of Southern Denmark must possess well-defined core competencies.
The core competencies of the programmes are defined on the basis of the specific scientific and technical tasks that graduates are expected to perform. For this reason, the programmes' core competencies are based on future professional functions and job profiles. The core content of individual programmes is described as constituent subjects subdivided into a smaller number of subject columns with academic progression throughout each programme.

1.3.2 General competencies

The ability to work as an engineer requires graduates to possess a number of general competencies, including the ability to take on new knowledge and to develop throughout their working lives. From this perspective, engineers trained at the University of Southern Denmark must have the capacity to:

Work independently and be able to:

- Plan strategies for their own learning process
- Evaluate their own learning process
- Focus in-depth on technical disciplines
- Formulate and analyse a problem in a structured manner

Cooperate and be able to:

- Work in an interdisciplinary context
- Work with people from other academic and cultural backgrounds
- Document and communicate their knowledge and results verbally and in writing to different target groups
- Evaluate the work of others and give them feedback
- Work in a project-oriented context and in teams

Apply their knowledge, skills and competencies in practice and be:

- Receptive towards new problems and solutions
- Innovative and creative
- Solution-oriented

1.3.3 Internationalisation

Internationalisation and globalisation play an increasing role in the development of our society. This means that an engineer's workplace, irrespective of whether it is in Denmark or abroad, is international.

For this reason, internationalisation is a central concern of engineering programmes at the University of Southern Denmark and an international dimension is an integral part of DSMI.

Vision

In the region of Southern Denmark, as elsewhere, the development of engineering disciplines and jobs for engineers must be based on engineering programmes based on the latest research and development, no matter where in the world this occurs. Engineering programmes at the University of Southern Denmark must ensure that graduates can work within an international framework and can function in a global labour market and have the ability to work across geographical and cultural borders.

Overall goals and framework structure for the internationalisation of programmes under DSMI

DSMI must help to build up and maintain a study environment in which international contact, co-operation and experience are integral parts of students' programmes.

Engineering students must experience working in a study environment alongside international fellow students and international teachers/researchers, which supports and develops their ability to cooperate across nationalities and cultures and allows them to mature them so that they can perform tasks in an international context.

The international dimension in DSMI rests on four columns:

- A well-functioning international study environment at the university characterised by the successful integration of foreign students.
- The enrolment of foreign students in engineering programmes. There is a portfolio of English-language programmes of various levels at the faculty that ensures the greatest possible flexibility in relation to enrolling students with foreign educational backgrounds within the framework of the specific disciplines.
- Attractive offers for exchange students from foreign partner universities.
- Opportunities for students to study abroad during their programmes. All engineering programmes regardless of level must provide students with the opportunity to study abroad for at least one semester. BEng students also have the opportunity for engineering internships abroad.

1.3.4 Cooperation with the business community

Engineering programmes are oriented towards professional and applied engineering, so cooperation between the business community and the university is decisive both for the development of the faculty's programmes and graduates' continued relevance for the labour market and for ensuring that the latest knowledge and new methods from the university can be introduced into the business community.

This is achieved through ongoing contacts between the business community and the university's education and research environments and through networking between students, teachers, researchers and company employees. If students are familiar with particular companies, this will be more efficient and reduce as far as possible the distance from education to job.
This is important not least for the regional labour market, where engineers also need to find work in small and medium-sized companies that employ only a few or no engineers.

Cooperation with the business community is therefore an integral part of DSMI.

Vision
The University of Southern Denmark's engineers must be able to transfer knowledge, skills and competencies from their studies out into companies and be an asset to business concerns.

During their studies students should carry out activities that enable them to understand the inherent opportunities and limitations the business community is subject to and the influence they have on the work of engineers. By cooperating with the business community, students can acquire knowledge of the way a workplace functions organisationally and culturally, become acquainted with practical problems and have the opportunity to apply the professional skills they have acquired to them.

General goals and framework structure for cooperating with the business community on programmes under DSMI
DSMI must help to ensure that students have contact with the business community by:

- Working with problems related to business during their studies
- Cooperating with companies in connection with projects, not least in final projects and theses
- Company internships (engineering work placement, periods at companies)
- Including company employees in various activities on programmes
- Company visits

1.3.5 Innovation and entrepreneurship
In the technical and scientific field, innovation and entrepreneurship are central to opportunities for development in Danish society and to growth in the global economy. This applies not least to the many small and medium-sized enterprises that are characteristic of the Danish business community, particularly in Southern Denmark.
For this reason, engineers need to know how to create and promote development in business and how to use their own ideas to develop a successful and innovative company.

Innovation and entrepreneurship are therefore central aspects of DSMI.

Vision
Engineers graduating from the University of Southern Denmark can bring the new knowledge and new methods learnt in its R&D environments out into society. These engineers should act as catalysts for innovation in existing companies and for generating new enterprises.

General goals and framework structure for innovation and entrepreneurship on programmes under DSMI
Students' innovative and entrepreneurial abilities will be strengthened through:

- A learning environment that encourages them to:

    - Seek new challenges
    - Solve problems creatively
    - Take the initiative
    - Work on an interdisciplinary basis
    - Discover opportunities rather than limitations

- Vocational activities that support their innovative and entrepreneurial abilities:
    - Courses in innovation and entrepreneurship
    - Company internships during their studies
    - The opportunity to work on their own business ideas in projects and elective courses
    - Competitions in innovation and entrepreneurship
    - Experts in Teams

Section 2: DSMI in practice – framework and implementation

2. DSMI – Structure and framework

This section contains a general description of the overall structure and the common framework of the curricula developed in pursuance of the Engineering Education Model of the University of Southern Denmark.

All of the faculty's programmes are organised in accordance with the same structural principles in order to support the learning environment and ensure that engineers trained at the University of Southern Denmark achieve the necessary general and core competencies. This uniform structure is designed to ensure that the educational model can be implemented and to define the framework within which the academic diversity of programmes can be realised.

Within related programmes and in relevant disciplines joint instruction will be possible between engineering programmes, and it will also be possible to make use of the University of Southern Denmark's broad interdisciplinary base by having joint instruction across faculties. This interdisciplinary instruction will be performed in such a way as to ensure adherence to the principles of DSMI.

2.1 Engineering programmes at the University of Southern Denmark

The faculty offers two types of engineering programme:

- Bachelor of Engineering (BEng) programmes
  A B.Eng. programme is a vocationally oriented bachelor programme that takes three and a half years. A B.Eng. programme aims primarily at employment in the business community but also gives direct access to graduate studies under the B.Sc. programme.

- BSc and MSc in Engineering programmes
  A BSc in Engineering programme comprises:
  - a three-year bachelor of science in engineering programme with the primary aim of qualifying students to continue studying on a graduate programme, but that also provides a number of vocational competencies.
  - a two-year vocationally-oriented master of science in engineering programme with the aim of procuring employment in a private or public enterprise that also offers the opportunity to embark on a research programme (PhD programme).

2.2 Structure of bachelor programmes

The standard duration of the **bachelor of engineering** (BEng) programme is three and a half years, the equivalent of seven semesters (210 ECTS points). The sixth semester consists of the engineering internship (30 ECTS points) and the seventh semester is the BEng Final Project (30 ECTS points). There must be elective courses with a minimum scope of 15 ECTS points in BEng programmes.

The standard duration of the **bachelor of science in engineering programme** is three years, the equivalent of six semesters (180 ECTS points), where the sixth semester is completed with a bachelor project (15 ECTS points). There must be elective courses with a minimum scope of 10 ECTS points in bachelor programmes.

2.2.1 Common elements – the BEng programme and the BSc in Engineering programme

- Thematic semesters – coherent semesters – the horizontal context of the programme
  The first four semesters of both the BSc in Engineering and B Eng programmes must be organised around **themes**. The curriculum describes the semester themes, value-based argumentation for the themes selected and the semester's competency targets.

  Each of the four first semesters must be planned as a fully cohesive process based on the semester's theme. As a principal rule, the semester must include:
    - A basic academic module of up to 10 ECTS points during the first and second semesters and one or two basic academic modules of up to 10 ECTS points during the third and fourth semesters.
    - A project-oriented module, normally with a scope of 20 ECTS points, which includes a semester project constituting approximately one-third of the student's workload during the semester. The project is performed in teams of six students and is begun at the same time as students begin work on the module's subjects. Towards the end of the semester when students are technically prepared to carry out the project assignments, project work will take up an increasing percentage of their workload.

  A **semester coordinator** must be assigned to each semester. A **semester team** is established for each semester consisting of the teachers and supervisors involved and the semester coordinator. The team, headed by the semester coordinator, is responsible for coordinating the semester activities and planning the semester on the basis of the experience gained from the previously held semester.

- Number of examinations
  A concluding examination is held in each module during the first four semesters of the programme to ensure semester cohesion. An examination may consist of several different elements (oral, written, project, portfolio, etc.). Exam activities completed during the semester

must be included as basis of assessment for the examinations in the basic academic modules on the first and second semesters.
Both the semester project and an individual oral examination must be included in the basis of assessment during the examinations in the project modules during the first to fourth semesters.

- Subject columns – the vertical context of the programme
  Subject columns represent groups of disciplines in which competencies are built up within a given subject field. They could be individual, complementary competencies or a series of disciplines that build up the student's competence within a subject field. The disciplines find expression during the courses comprised by the programme modules.
  Subject columns are defined separately for each programme and differ from programme to programme.

- Organising teaching
  Teaching must be organised in such a way as to support activating teaching and active learning. Lesson blocks are used and their extent is determined by professional and educational considerations. Four-hour blocks are primarily used during the first to fourth semesters.

- Planning units
  As a principal rule, a programme is built up in modules, the scope of which in ECTS points is divisible by 5.

- Innovation and entrepreneurship
  All programmes include the module Experts in Teams (EiT) during the fifth semester and have a scope of 10 ECTS points.

- Internationalisation

  - Studying abroad
    All programmes are structured in such a way as to enable students to study abroad at a foreign partner university during the fifth semester. Engineering internships during the sixth semester of the BEng programmes may also be taken at a company outside Denmark.

  - Teaching activities in relation to internationalisation
    It must be possible in all programmes to perform teaching activities in English with a scope of at least 10 ECTS points. During the course of their study programmes, students must meet at least two of the following criteria:
    - Take part in modules taught and assessed in English
    - Preparation of and examination in a product written in English (semester project, bachelor project, Experts in Teams, etc.)

- Preparation of and examination in a written product in collaboration with foreign students (semester project, bachelor project, Experts in Teams, etc.)
- Study abroad at a partner university
- An internship at a company abroad or a Danish company at which the corporate language is English

- Company collaboration
  During their study programmes, students must have the opportunity to work with examples and problems from companies involved in the professional field of the programme, and to perform educational activities in collaboration with a company. This could take the form of an internship or writing a project in collaboration with a company, for instance.
  A least one major project (semester project, bachelor project, or similar) must be performed in collaboration with a company. The goal at SDU is for more than 90% of BEng final projects to be performed in collaboration with a company.

2.2.2 Typical structure of the B.Eng. programme

DSMI BEng programme – typical structure

7th semester	Final project					
6th semester	Engineering internship					
5th semester	Specialisation/Electives				Experts in Teams	
4th semester	Basic academic modules		Project module 4			
3rd semester	Basic academic modules		Project module 3			
2nd semester	Basic academic module 2		Project module 2			
1st semester	Basic academic module 1		Project module 1			
ECTS points	5	5	5	5	5	5

2.2.3 Typical structure of the BSc in Engineering programme

DSMI bachelor of science in engineering programme – typical structure

6th semester	Specialisation/Electives			Bachelor project		
5th semester	Specialisation/Electives				Experts in Teams	
4th semester	Basic academic modules		Project module 4			
3rd semester	Basic academic modules		Project module 3			
2nd semester	Basic academic module 2		Project module 2			
1st semester	Basic academic module 1		Project module 1			
ECTS points	5	5	5	5	5	5

2.3 Structure of MSc in Engineering programmes (postgraduate)

The MSc in Engineering programme, which is a continuation of a BSc in Engineering programme or a BEng programme, has a standard duration of two years, the equivalent of four semesters (120 ECTS points).

As a principal rule, the programme is structured as follows:

- Compulsory common and profile-constituent modules corresponding to at least 60 ECTS points comprising:
  - Compulsory, common constituent modules corresponding to at least 30 ECTS points
  - Compulsory profile-constituent modules corresponding to at least 20 ECTS points if profiles are offered in the programme
- A thesis with a scope of at least 30 ECTS points
- Elective courses with a scope of at least 15 ECTS points. Students must at minimum have the following choices for completing their elective pools:
  - 15 ECTS points elective courses
    or
  - 15 ECTS points in-company period
    or
  - 15 ECTS points individual activity with the development of their own business concept
    or
  - 5 ECTS points elective courses and the first 10 ECTS points of a 40 ECTS points thesis

2.3.1 Common elements

- Planning units
  As a principal rule, a programme is made up of modules, the scope of which in ECTS points is divisible by 5.

- Introductory course
  The first semester of a postgraduate programme must be organised so that it builds on the qualifications that students bring with them. An integrated introductory course enables students to adapt to the learning environment and the academic level of the programme.

- Specialisation
  It must be possible for postgraduate students to specialise in a number of academic fields. This can be done with the help of profiles where the compulsory, common constituent subjects of the programme are supplemented with compulsory profile-constituent subjects for each profile. For programmes without profiles, the opportunity for specialisation is ensured

with a varied range of elective courses and the opportunity to write a thesis encompassing two or more subject areas.

- Internationalisation
  Postgraduate programmes are usually offered in English.

  - Studying abroad
    All postgraduate programmes are structured in such a way that students can take a semester (typically the third semester) abroad at a foreign partner university.

- Company collaboration
  During their study programmes, students must have the opportunity to work with examples and problems from companies involved in the professional field of the programme, and to perform educational activities in collaboration with a company. This could take the form of an internship or writing a project in collaboration with the company, for instance.
  An in-company period is an opportunity on all postgraduate programmes and is taken during the third semester of a programme. During the internship, which is standardised to take half a semester, in addition to their studies at the university, students will be at a company for at least two days a week where they perform a company-related, study-oriented project assignment at MSc in Engineering level.
  The goal at SDU for all postgraduate programme is that more than 50% of final theses must be completed in collaboration with a company.

- Thesis
  A master thesis normally has a scope of 30 ECTS points, but students may choose to write a thesis with a scope of 40 ECTS points by including 10 ECTS points from the elective pool during the third semester.

- Special research activity
  In addition to taking part in the research-based postgraduate programme as such, postgraduate students must have the opportunity to take part in research activities either in connection with their theses or as an individually-approved study activity with a scope of up to 5 ECTS points. The activities must enable students to write a scientific article focusing on theory and/or practice that may be submitted for publication to a relevant technical journal or periodical, or read at a conference or similar venue.

2.3.2 Typical structure of a MSc in Engineering programme (postgraduate)

DSMI postgraduate programme – typical structure

4th semester	Thesis					
3rd semester	Elective/profile-constituent courses			Elective courses/thesis/in-company period		
2nd semester	Common/profile-constitutent courses					
1st semester	Common constituent modules					
ECTS points	5	5	5	5	5	5

Section 3: The learning environment

The Engineering Education Model of the University of Southern Denmark is founded on activating and problem-based learning on the basic assumption that activating teaching and active learning are the best ways to ensure that students derive benefit from their programmes and to ensure that they acquire the competence profile that the programme in question holds out the prospect of.

At the same time, it is a basic assumption when working with the programme's disciplines that activating teaching and active learning help to develop a number of general competencies that the fully-qualified engineer needs in his/her profession on completion of a programme.

3.1 The learning environment

The learning environment in DSMI is built up around the *student*, cf. figure 1, who interacts with the:

- ***Subject***, which represents teaching activities in delimited disciplines with their concepts, theories and methods.
- ***Project***, which represents work on interdisciplinary and application-oriented problems in project form.
- ***Team***, which represents teams of fellow students who the student is together with in an educational context.

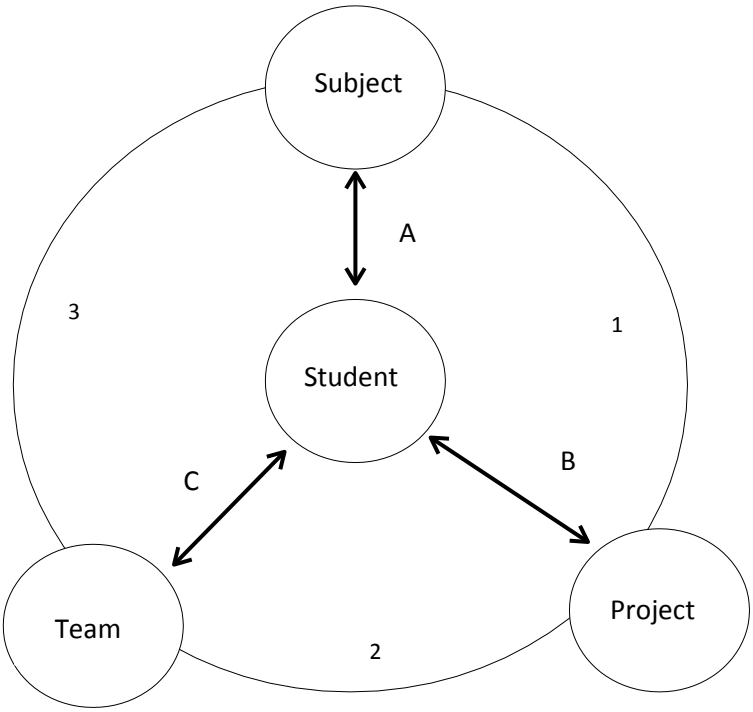

Figure 1. Interaction among the primary elements of the learning environment

Interaction between student and subject

The area of the learning environment based on the individual student's participation in subject-oriented courses corresponds to line A in the model, which connects the elements Student and Subject. The student builds up his/her subject-specific knowledge, skills and competencies in this area. Various types of teaching are used in order to help the student to develop his/her ability:

- To systematically analyse problems with the help of mathematical and scientific models and possibly experiments
- To evaluate, select and structure knowledge
- To concentrate on academic disciplines
- To develop self-discipline, perseverance and responsibility
- To evaluate the relevance and quality of his/her own work
- To recognise differences in learning styles and levels

Interaction between student and project

That area of the learning environment that is based on the student performing projects corresponds to line B in the model, which connects the elements Student and Project. Performing projects can help to strengthen the student's creativity, initiative and self-confidence. The experience of succeeding in completing what appeared to be an impossible assignment can encourage the student to take up new challenges.

Project work is based on an application-oriented, open problem complex within a smaller number of delimited subject fields. Working on and organising a project provides an opportunity for more in-depth and coherent learning, which helps the student to develop his/her ability:

- To formulate and delimit problems
- To develop new ideas
- To put a theory into practice and derive theory from practice
- To evaluate and select solutions
- To communicate knowledge and results
- To plan his/her own time consumption and resources

Interaction between student and team

That area of the learning environment that is based on a student performing a learning activity together with a team of fellow students corresponds to line C in the model.

The student works on one or more disciplines, such as a project, in the form of structured team work with a teaching team that is actively involved in setting up the team and follows the work performed in the team. This gives the student an opportunity to develop his/her cooperative ability and provides him or her with:

- Experience of team roles, counselling, communication, negotiation
- An understanding of the importance of agreements, plans and a framework
- The ability to evaluate the quality and relevance of his/her efforts and those of others
- Experience of knowledge-sharing as a means of arriving at deeper and broader academic understanding
- An awareness of cultural and social standards, values and diversities
- Tolerance and respect for others

Interaction between subject and project
When teaching takes the form of students performing projects in connection with one or more disciplines, which corresponds to connection 1, it becomes possible to place the discipline/disciplines in an interdisciplinary context. This provides the student with the opportunity:

- To arrive at a deeper and broader understanding of the individual subject
- To develop an understanding of the project as a whole and of its context, of economic, environmental and ethical matters, for instance
- To independently acquire new disciplines for solving problems connected with the project
- To develop his/her ability to analyse more complex problems
- To gain an overall view of a wide range of solution strategies

Interaction between project and team
When a team of students work together to perform a project, which corresponds to connection 2, an additional dimension of learning outcomes arises from their teamwork and project work, cf. the description of lines B and C above. The team's work on the project increases the need for coordination, planning, delegation, knowledge administration and communication. This makes it possible for the student to enhance his/her:

- Sense of responsibility, commitment and overall view
- Experience with project administration, management, coordination and resource planning
- Experience with complex project models
- Ability to share knowledge, collect, evaluate and communicate ideas and solutions
- Receptiveness to creative and innovative solutions that take into account the unity that the project is part of
- Ability to communicate results and conclusions with regard to various methods and different target groups

Interaction between subject and team
When a team of students work together on academic studies, which corresponds to connection 3, a more qualified accumulation of subject-specific knowledge and skills can be achieved, cf. the description of line A above. Cooperating with others, also when working on the subject, cf. the description of line C above, means that the student can enhance his/her ability:

- To teach and advise his/her peers
- To evaluate the quality of each other's work
- To perform academic self-evaluation and quality assurance

Interaction among all of the elements of the learning environment
Problem-oriented project work in teams with the inclusion of the programme's disciplines is a central educational method in DSMI. It is also suitable for working on an interdisciplinary basis. Depending on the specific constellation of the various elements of the learning environment, the student's abilities will be enhanced in a number of the areas described above.
When a project takes its point of departure in problems that are closely related to practice, or to current problems at a company, this type of teaching achieves a very high degree of authenticity and a similarity with the working methods that are in demand in the business community and that the newly-qualified engineer will encounter in his/her working life.

3.2 Professional standards from day one

The Engineering Education Model of the University of Southern Denmark makes great demands on the student through its learning environment; demands for attendance, active participation, collaboration and so on. It is vital for the student to be highly motivated on his/her study programme in order to meet these demands. Among other things, motivation depends on the student being able to see the goal of his/her study programme, being able to understand the connection between the various elements of the programme and to identify with the programme's core competence.

The early encounter with the programme's core competence is therefore a central aspect of the harmonisation of expectations between the student and the programme that helps to confirm the student's choice of programme at an early stage.

This is achieved when students becomes acquainted with the various facets of the core competence and the learning environment at the beginning of their study programme. Students must reach an understanding of the programme that makes it possible to relate the basic academic, theoretical subjects to the core competencies at an early stage. They must rapidly reach an understanding of the purpose and importance of the various elements of the learning environment in relation to the structure of the core competence and the competence profile which create a foundation for seeking employment on completion of the programme.

3.3 Evaluation and feedback

Evaluating the student's work is an integral part of the activating teaching in the Engineering Education Model of the University of Southern Denmark and is used to support the student's active learning.
There are basically two types of student evaluation:

- Ongoing evaluation, which is used to give the student feedback and activate him or her during the course of a semester, but which may also include exam activities that form part of the final evaluation.
- Examinations, which indicate the student's final level of attainment at the end of a semester. Examinations may also include work and activities performed during the course of teaching.

It applies to both types of evaluation that:

- There must be a conscious choice of types of evaluation and feedback in order to support the student's learning in the best possible way.
- There must be clear concord between the individual teaching activity and the accompanying types of evaluation and feedback.
- Evaluation and feedback must be transparent, so that students are clearly aware of their academic level, the stipulated requirements and how these can be fulfilled.

Ongoing evaluation
The purpose of ongoing evaluation is to support the student's learning in the best possible way. Ongoing evaluation must make it possible for students to find their way through the study programme, adapt their work performance and adjust focus areas.

Ongoing evaluation must:
- Capture the student's attention and time
- Encourage the student to perform relevant study activities
- Provide feedback in connection with learning activities during the course of a semester
- Emphasise and illustrate the core competence of the study programme

The teacher may make use of a number of different types of evaluation in connection with an ongoing evaluation, such as:
- Poster sessions
- Portfolios
- Lectures
- Conferences
- Written work, such as minor projects with reports/journals, assignments, laboratory and simulation assignments, calculation assignments, tests and milestones in connection with projects.

The appraisal of the ongoing evaluations can be assessed variously:
- By teachers and supervisors
- By students themselves (*self-assessment*)
- By students' mutual appraisal (*peer-assessment*).
- By combinations of the above

Ongoing evaluation is thus chiefly formative, but elements of the ongoing evaluation may wholly or in part be included in the final evaluation as exam activities during the semester. Ongoing evaluations appraised using peer and/or self-assessment cannot be included in the final evaluation

Examinations
The purpose of examinations is to:

- Create a basis for assessment regarding the students' ability to demonstrate that they have fulfilled the learning objectives.
- Ensure the quality of teaching in relation to making it possible for students to fulfil the given learning objectives.

Examinations are thus summative, but may include formative elements from the ongoing evaluation in the form of exam activities during the semester, for instance.
The type of examination can and should be varied within the individual programme in accordance with the wide range of examination types that appear in the university's list of educational tools.

Examinations are assessed by one or more teachers/supervisors, possibly with the inclusion of an internal (co-examiner) or external examiner.

3.4 Students' evaluation of teaching and programme

The Engineering Education Model of the University of Southern Denmark must ensure that the students benefit from teaching and that they acquire the competencies described in the programme's competence profile. Students must therefore be able to give regular feedback to teachers and those responsible for the organisation of the programme with the aim of developing the programme. This is done in pursuance of the University of Southern Denmark's quality assurance policy and the university's principles for students' evaluations of teaching and of programmes as a whole.

Teaching evaluation must:

- Ensure discussions and clarifications of the students' expectations for teaching, and teachers' expectations for students.
- Ensure reflection over the learning outcome and the coherence of the course of teaching and the programme.
- Ensure that teaching is performance in accordance with the module and the goals for teaching outcomes described.

Programme evaluation must:

- Ensure that the students achieve the academic level and the learning objectives described in the programme's competence profile.
- Ensure an educational quality that supports the students' learning and opportunity to achieve the learning objectives of the competence profile.