

# **Academic regulations for Master of Science in Engineering (Technology Based Business Development) (2008)**

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### **1. The outline provisions of the programme**

#### **(1) Name of degree programme**

In Danish: Cand.polyt. i teknologibaseret forretningsudvikling. In English: Master of Science in Engineering (Technology Based Business Development).

#### **(2) Degree**

The Master's programme provides graduates with the title of candidatus/candidata polytechnices (civilingeniør) i teknologibaseret forretningsudvikling. In English: Master of Science in Engineering (Technology Based Business Development).

#### **(3) The academic direction and primary subject areas of the programme**

The objective of the Master's programme in technology based business development is to produce graduates who contribute to the creation of new innovative production and product concepts, business concepts and business areas. Thus, the programme develops knowledge, competencies and skills within two core competence areas; an engineering area focusing on technical design and technology development and a business development area which is integrated in the former (engineering) area.

#### **(4) Academic skills and qualifications**

MSc in Engineering (Technology Based Business Development) is a research based, individually designed programme with common course elements which facilitates advanced studies based on an entry qualifying Bachelor programme. There is a substantial focus on the creation of cross-disciplinary competencies within technology and business as well as a focus on meta-competencies within development of systematic business development knowledge on the basis of scientific theory and method.

More specifically, this is achieved by means of the following competencies, skills and knowledge areas:

- To seek out, understand, assess and attract new knowledge, new business opportunities and new relevant technologies for the company through external knowledge networks and knowledge sources.
- To implement this knowledge in the company, thereby creating new product features and business areas; this includes development and adjustment of the technology. This is achieved by creating a creative physical and psychological learning environment which promotes employees' inclination to acquaint themselves with new technologies and business areas.
- To identify the necessary professional and personal employee competencies present among the technological and mercantile staff and through recruitment and staff development to create the staff culture mentioned above.
- To develop innovative technological products and to develop the marketing platform which increases the likelihood of a successful sale.

Upon successful completion of the Master's programme, graduates are expected to be employed in companies as Business Developers, Project Managers in Research & Development or Product Managers in (technical) Sales and Marketing.

#### **(5) Standard length (ECTS)**

The prescribed duration of the Master of Science in Engineering (Technology Based Business Development) programme corresponds to 120 ECTS.

#### **(6) Authority**

The academic regulations for the Master of Science in Engineering (Technology Based Business Development) programme is prepared in accordance with:

Executive Order no. 338 of 6 May 2004 regarding the Bachelor's and Master's degree programmes at universities (the Education Executive Order) with subsequent amendments in accordance with Executive Order no. 805 of 19 August 2005.

Additional rules relating to degree programmes can be found in the University of Aarhus electronic rules and regulations at [www.au.dk/en/rules](http://www.au.dk/en/rules).

#### **(7) Admission requirements and prerequisites**

The following undergraduate programmes are qualifying:

- Bachelors of engineering focusing on mechanics, production or exports, including the Global Management and Manufacturing programme at AU-IBT.
- A technical Bachelor's degree.
- The first 3 years of the Business Development Engineer programme corresponding to 180 ECTS
- Other similar programmes provided that the head of studies assesses that their level, extent and content correspond to the degrees mentioned above.

The undergraduate programme is required to contain an element of innovation and business development corresponding to at least 15 ECTS credits. These ECTS credits are typically obtained by means of a final project containing significant elements of innovation and business development or by means of minor subjects.

Seeing that the programme is offered in English, the applicants are subject to a requirement to document English language proficiency at level B, e.g. by means of internationally recognised tests, cf. section 11 in the Executive Order no. 32 of 29 January 2008 regarding admission to Bachelor's and Master's degree programmes at universities etc. (Executive Order on admission).

AU-IBT offers applicants who lack 15 ECTS credits or less within innovation and business development an intensive course programme at study commencement as an alternative to established preconditions. The course is arranged by the head of studies who is also academically responsible for the content.

### **(8) Other regulations**

Moreover, the regulations which appear from the general provisions of the academic regulations concerning exemptions, credit, student counselling etc. apply to the programme; (cf. Authority above).

The MSc in Engineering (Technology Based Business Development) programme belongs under the Board of Studies for the MSc in Engineering (Technology Based Business Development) programme at AU-IBT (studienævnet for cand.polyt.-uddannelsen ved AU-HIH).

## **2. The structure of the programme**

The structure, content and progression of the programme are displayed below:

	Core courses	Technology Specialisation	Project
1 <sup>st</sup> semester	Technology Management I (5 ECTS) Technology Management II (5 ECTS) Methods and Approaches to Technology in Enterprises (5 ECTS)	Technology Specialization I (5 ECTS)	10 ECTS
2 <sup>nd</sup> semester	Strategic Management and Innovation (5 ECTS) Organizing, Human Resources and innovation (10 ECTS) Seminar: Methods and Approaches	Technology Specialization II (5 ECTS)	10 ECTS
3 <sup>rd</sup> semester	Studies at a foreign university (25 ECTS) or studies at Aarhus University in technology	Technology Specialization III (5 ECTS)	None

	based business development (25 ECTS) or combinations with focus course in technology based business development (25 ECTS)		
4 <sup>th</sup> semester	Master Thesis (30 ECTS) Seminar: Methods and Approaches		

The structure and content of the courses appear from the course descriptions.

- Instruction: The instruction takes place two days a week and the language of instruction is English.
- The core courses constitute the main content of the programme and they are identical for all graduate students. Please consult the course descriptions for course content.
- Technology specialisation: The 3 technological courses provide the students with an opportunity for an individual technology specialisation. This specialisation is agreed upon with the mentor company and the head of studies based on the company's area of business, the content of the mentor company contract and the student's own wishes. The student may choose between the curriculum at the university or individually tailored specialised courses. For students with a Business Development Engineer background, the recommended technology specialisation is within information technology or renewable energy technology which constitute the AU-IBT core competencies. Please consult the course descriptions for course content.
- A pivotal part of the programme is the mentor company arrangement under which the student enters into a 2-year project agreement with a company allowing company issues, core courses and technology courses to systematically interact. These projects are at a very high and complex academic level and the student are, in close cooperation with the main supervisor from the university, technical secondary supervisors and the company supervisor, required to delimit a problem, collect scientific literature and external expert knowledge, build the necessary model and theory apparatus and perform data collection and/or experiments resulting in implementable solutions. A great part of the academic learning lies in these company projects, for which reason Aarhus University provides a large number of main supervisors, technical expert supervisors and laboratories for these company projects in order to be able to provide individual supervision.
- The mentor company arrangement is headed by the head of studies: The student may choose between the mentor companies provided by the programme or the student may, as agreed with the head of studies, independently find a mentor company. The head of studies or a representative participates in the dialogue with the company and a mentor company contract is prepared which describes the content of the mentor company projects of the 4 semesters. The contract must be approved by the head of studies, thereby ensuring academic depth, direction and progression.

- On the 3<sup>rd</sup> semester, the student follows optional courses at either Aarhus University, at a foreign university or the like. The student may choose from Aarhus University's partner universities or he/she may independently suggest a university. The chosen courses at the foreign university must be approved by the head of studies.
- The student's total study programme must be approved by the head of studies.
- The programme is offered by the Centre for Innovation and Business Development at AU-IBT. The programme is research based with technology management, production and product development, innovation management and business development as research areas. The focus is on applied research with a close proximity to practice and the company.

### **3. The programme's individual subjects and exams**

This section provides brief descriptions of courses, company projects, technology specialisations, specialised courses and Master Thesis, including their objectives and competency developing aim. Detailed course descriptions may be found in the AU-IBT study guide; please visit: <http://www.hih.au.dk/Studieguide-2537.aspx>.

#### ***Technology Management I***

The course applies an internal focus. The objective of the course is to enable the student to:

- Establish a physical creative learning environment which continuously supports the development of innovative production and product concepts.
- Project manage technological innovative and complex development projects.
- Manage technology rights.

Examination: The student submits an assignment within an agreed-upon subject area which will be assessed on the basis of its combination of theory, method and empirical data, including the application of the syllabus. Technology Management I and II are examined jointly.

#### ***Technology Management II***

The course takes an external view. The objective of the course is to enable the student to:

- Identify long-term market and social trends which may prompt new business areas.
- Establish external technological knowledge networks which may lead to radical new technologies for the company.
- Identify, assess and implement technologies from these networks which utilise the opportunities in the new identified business areas.

Examination: The student submits an assignment within an agreed-upon subject area which will be assessed on the basis of its combination of theory, method and empirical data, including the application of the syllabus. Technology Management I and II are examined jointly.

#### ***Methods and Approaches to Technology in Enterprises***

The course is a theory and method course which interacts directly with company projects and technology specialisations and leads to the theory and method choices of the Master's Thesis. The

objective of the course is to enable the students to understand and apply the most important methods of technology development and technology application in companies. This is a multiparadigmatic field and consequently, the students learn to understand and analyse from several scientific theoretical paradigms.

The method part is divided into three pillars:

- Laboratory and experimental work in which experiment planning and systematic parameter variation etc. form part.
- Quantitative data collection with questionnaires, recording mechanisms etc.
- Qualitative empirical work with interviews and observations etc.

The course is reported in a synopsis which in detail describes problem, theory and method for one or more company projects and technology specialisations. This is followed by an oral examination with internal examiner.

The course is followed by two seminars on the 2<sup>nd</sup> and 4<sup>th</sup> semester which are to support theory and method application in the other courses.

### ***Technology Specialization I, II and III***

The three technology specialisation courses should support the company project. The objective of the courses are to enable the student to independently learn any complex technology, perform calculations and experiments and translate theory and experiments into an operational solution including an experimental setup continuously throughout his/her professional career. The student receives comprehensive supervision from his/her technical supervisor and from the expert supporting the learning.

Examination: The student submits a scientific report within the agreed-upon subject area. The report is required to describe the technology, including calculation examples, experimental measurement results and examples of application relevant in relation to the company project. If possible, the student should demonstrate the technology physically on the day of the examination.

### ***Company Project I and II***

The objective of the course is to enable the student to:

- Apply the theory area of the semester on a complex and practical problem.
- Independently and methodically acquire knowledge from experts, scientific literature and experiments.
- Formulate this knowledge in the form of models and theories.
- Critically analyse and reflect on his/her empirical activities.
- Translate this knowledge into practical solutions.

The student receives intensive supervision from the project supervisor, the technical supervisor and the company supervisor.

Examination: The student submits a scientific report which is subject to an oral examination.

### ***Organizing, Human Resources and Innovation***

The course combines the understanding of organisational processes with human resource management; both viewed from an innovation and technology perspective.

The course provides a basic introduction to organisation as structure and organisation as process. It draws on classical and more recent organisational theories, thereby developing the students' insight into multiparadigmatic approaches. The course develops competencies in synthesis of several approaches to the hyper flexible and hyper emergent organisational processes of the knowledge economy.

Within classical (system theoretical oriented) organisational theory, basic conceptions within structurally oriented theory supplemented with understanding of the change models, diagnosis approaches and intervention mechanisms of the approaches are examined. The role of technology and innovation is discussed.

Within more recent (postmodern and interpretation oriented) organisational theory, basic conceptions of organisation in flux, network organisation, process oriented organisation are examined. This encompasses business process mapping models. The role of technology and innovation is discussed.

The course provides a basic introduction to human resources and the management of them. Different paradigms (sociological, psychological etc.) within human resources are discussed. Furthermore, the course presents an overview of concepts such as recruitment, job design, incentive systems, competency development, internal and external labour market. Types of management such as coaching and self-leadership are also examined. Change models from the organisational theories are combined with human resources with a special view to technology and innovation. The students are subject to an oral examination on the basis of a small written assignment.

### ***Strategic Management and Innovation***

This course focuses on how strategic capacity can have an impact on innovation performance and it aims at separating strategic development and day-to-day activities in the company. The course will not focus on the traditional strategic management theory. Instead, the course seeks to address strategic management as a question of how to gain competitive advantages by influencing the organisational processes.

The purpose is to teach the students how to formulate and implement a business development strategy and how to create a tight link between strategy formulation and implementation in a dynamic and global perspective.

Having participated in this course, the student should be able to:

- describe different strategic management models
- analyse strategic problems and relate them to strategic theories
- evaluate and combine different strategic management models in order to promote innovation
- evaluate different strategic models in order to develop a suitable model within specific practical contexts
- analyse and generalise different strategic management theories

### ***Focus course in Technology Based Business Development***

The course is a specialised course in a particular focused subject within technology based business development. Students interested in completing a focus course must approach a programme supervisor. Then, a course description encompassing size, form, content, timeframe and examination form is prepared. The course description must be approved by the head of studies.

The course must be theoretical, combined theoretical and empirical and/or experimental.

The objective of the course is to ensure that students who can and want to work independently with projects at a high academic level have the opportunity to develop competencies within specialised areas.

It will typically be a 2<sup>nd</sup> or 3<sup>rd</sup> semester course.

### ***Third semester specialisation (study abroad)***

At the 3<sup>rd</sup> semester, the student studies optional courses offered either at Aarhus University, at a foreign university or the like.

The student may choose from Aarhus University's partner universities or he/she may independently suggest a university.

The chosen third semester courses, regardless of form, must be approved by the head of studies.

### ***Master Thesis***

The objective of the Master Thesis is to enable the student to:

- Identify and delimit a complex problem which is so comprehensive that it reflects all the important elements of the Master's programme.
- Independently acquire knowledge from experts, scientific literature and data collection and experiments. This knowledge must be gathered on a scientific theoretical method basis.
- Communicate this knowledge in the form of independently developed models and theories.
- Conduct the analysis by means of this developed theory.
- Translate this knowledge into practical solutions.
- Assess and be critical of the solution.



When initiating the Master Thesis, the head of studies approves the subject and supervisor of the project. A timeframe is established (cf. the Education Executive Order). These conditions are written down in an agreement.

The programme has a corps of supervisors who are approved by the Board of Studies.

In addition to the main supervisor, the student has the opportunity to be assigned a secondary supervisor. The project supervisor may be a member of the academic staff at Aarhus University, at another public research institution or at a private research institution/company.

The Master Thesis may be prepared wholly or partly within the context of a company; a company representative may participate as secondary supervisor.

The Master Thesis is written in English with a summary in Danish and English.

The Master Thesis cannot be subject to credit transfer from other institutions.

Examination: The student submits a scientific report which is subject to an oral examination. A written assessment of the written work is prepared and handed over to the student.

## **4. Other rules and regulations**

### **(9) Credits and flexibility**

The Board of Studies may approve elements from other programmes or contexts. The Master Thesis, however, cannot be subject to credit transfer.

### **(10) Examinations**

The assessment and examination methods of the individual courses appear from the course descriptions in the course catalogue. The catalogue also indicates the time for the ordinary course examination as well as any re-examination.

Participation in a re-examination in a given course presupposes participation in the ordinary course examination. Courses must be passed separately unless the academic regulations stipulate that they are to be examined jointly with other courses. One mark is allocated for each examination unit.

Each course is concluded by one of the following forms of examination:

1. Written examination.
2. Oral examination.
3. Home assignment(s) (written examination).
4. Multiple choice (written examination).
5. Approval of compulsory assignments and/or reports followed by a discussion, if applicable.

6. Active participation in the course followed by a discussion, if applicable, e.g. attendance at a minimum of 80% of compulsory lessons, seminar contributions, submission (and approval) of compulsory assignments etc.
7. Skills test (practical test).
8. Other forms of examination approved by the Board of Studies.
9. Combinations of 1–8

The students may be granted exemption from the approved forms of examination when considered appropriate. Exemption is granted by the head of studies following guidelines issued by the Board of Studies.

### **(12) Spelling and fluency**

In all major written assignments, regardless of the language used, the student's spelling and writing skills form part of the assessment. Most important is the academic content but spelling and writing skills affect the assessment of whether the student meets the overall aims.

### **(13) Maximum duration**

The prescribed period of study is 2 years; the programme, however, must be completed within maximum 2.5 years.

### **(14) Exemptions**

An exemption is a deviation from the regulations that normally apply for the area in question. Exemption may be granted on the basis of an application sent to the authority that has the power to grant such exemption.

An application for exemption must be submitted to the Board of Studies. If another authority has the power to grant an exemption, the Board of Studies forwards the application to the appropriate authority (e.g. the dean, rector or ministry).

An application for exemption must be made in writing, it must be substantiated and submitted as soon as possible. For the application to be immediately processed, it must include a precise account of the regulation from which exemption is sought and the objective of such an exemption (e.g. permission to use special aids, extension of examination time, postponement of time limits). Documentation for the unusual conditions which justify exemption must be enclosed with the application. Normally, undocumented conditions are not taken into consideration.

### **(15) Appeals and complaints**

Complaints must be submitted to the Board of Studies. It is a prerequisite for immediate processing that the complaint is made in writing and that it is substantiated.

Complaints regarding examinations must be submitted no later than 14 days after publication of the examination result cf. the examination order, ministerial order no. 867 of 19 August 2004 on university examinations, STI, part 8, please consult <http://www.au.dk/da/regler/2008/au7>.

## 5. Changes

Effective date 1 January 2009.

<b>Date</b>	<b>Remark</b>	<b>Effective date</b>
1 September 2008	Preliminary academic regulations	1 September 2008
1 December 2008	Development of the Master Thesis rules Modifications of the technology specialisation rules Small modification of the Organizing, Human Resources and Innovation course Small modifications of the rules and regulations	1 February 2009
1 January 2009	Preliminary academic regulations are replaced by permanent academic regulations	1 January 2009