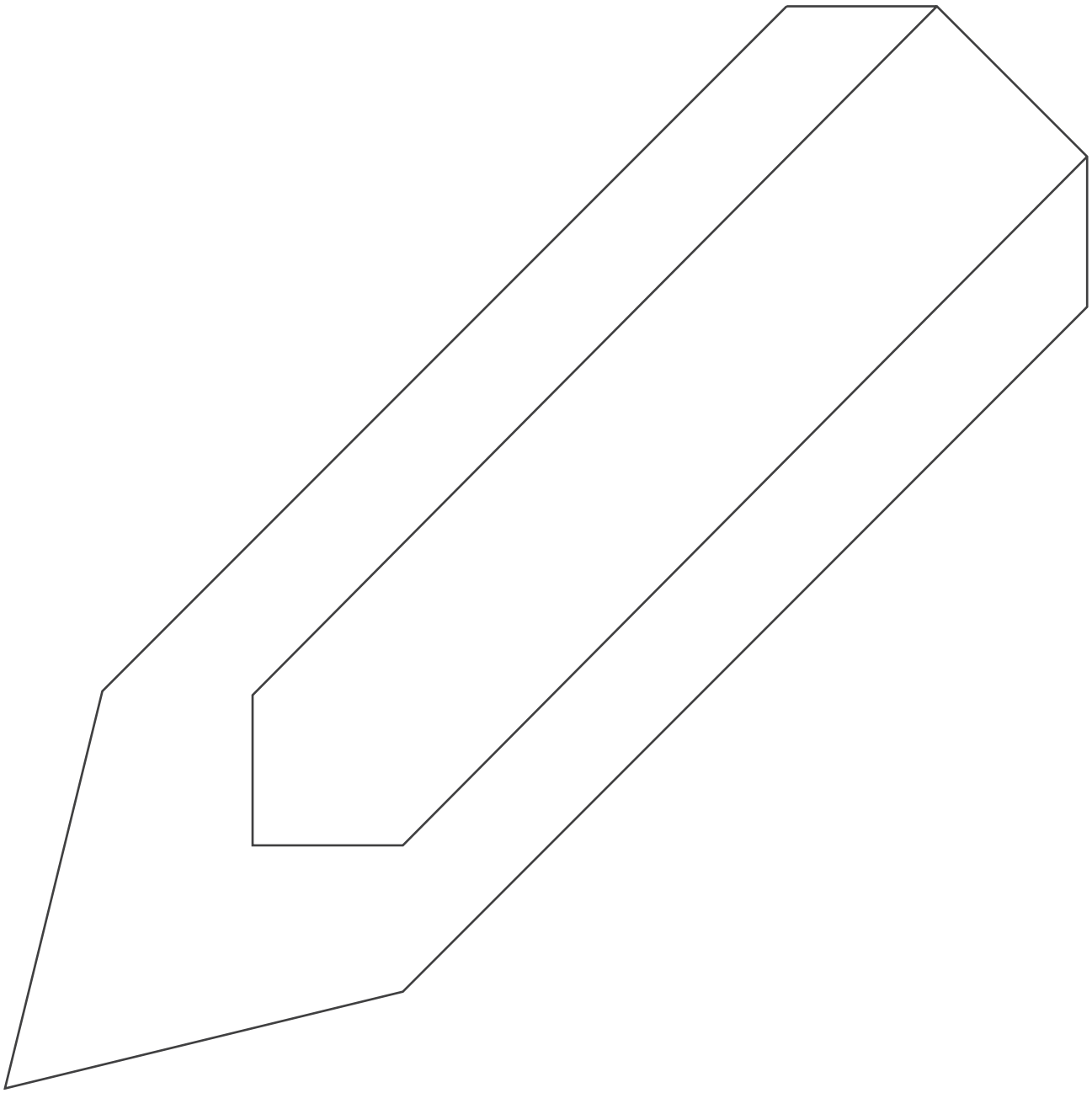
VIA University College

Curriculum

Bachelor of Engineering in Mechanical Engineering

Valid from August 2016 until January 2019



CONTENTS

Introduction

This curriculum is valid from February 2017. The curriculum is issued in accordance with:

- Ministerial Order no. 527 of 21 June 2002 on the Bachelor Programme in Engineering (*Bekendtgørelse om diplomingeniøruddannelsen*)
- Ministerial order no. 1519 of 16 December 2013 on tests and examinations in professionally-oriented programmes: Link to English translation
- Ministerial Order no. 114 of 3 Februar 2015 on the Marking Scale and Other Forms of Assessment (*Bekendtgørelse om karakterskala og anden bedømmelse*)
- Act no. 1147 of 23 October 2014 on Academy profession degree programmes and Professional Bachelor programmes *(Bekendtgørelse af lov om erhvervsakademiuddannelser og professionsbacheloruddannelser)*
- Ministerial Order no. 1521 of 16 December 2013 on Academy profession degree programmes and Professional Bachelor programmes: Link to English translation

In cases where this curriculum is not in compliance with existing and valid ministerial acts and orders, the ministerial acts and orders are applicable.

The students are expected to have read and understood the contents of this curriculum which can be found on the VIA University College website www.viauc.com.

The students will get a personal VIA e-mail address and get access to Studynet, the VIA intranet. This e-mail address and the Studynet are used for all communication between students and faculty in the Mechanical Engineering programme. Therefore, material and information sent this way is assumed read by the student.

In the following VIA University College will be referred to as VIA.

1 Aim of the degree programme

The Bachelor of Engineering Mechanical Engineering programme at VIA is a complete degree and according to Executive Order on the Bachelor Programme in Engineering *the objectives of the degree are to provide the students with the necessary qualifications to function in jobs internationally and nationally where they will be able to:*

1. *Translate technical research results as well as scientific and technical knowledge to practical application in development assignments and in solving technical problems*
2. *Critically acquire new knowledge within relevant fields of engineering*
3. *Solve commonly occurring engineering tasks independently*
4. *Plan, realise and manage technical and technological systems and in this connection be able to address social, economic, environmental and occupational health issues involved in solving technical problems*
5. *Enter into cooperative and management functions and connections on a qualified level with people, who have various educational, linguistic and cultural backgrounds.*

In addition, the degree programme will qualify the students to obtain further education.

The mechanical engineering degree programme at VIA furthermore aims to qualify graduates to perform work functions, where the main objectives are product development and construction of machines and systems, with an option of specialising in 1) Intelligent Mechanics, 2) Innovation and Product Design or 3) Sustainable Energy.

It is vital that graduates within the above mentioned specialisations achieve a profound understanding of natural scientific issues, experimental qualifications and IT tools. At the same time, it is an objective that the graduates develop qualifications to function as project managers within the field of mechanics, both nationally and internationally.

The objectives of the degree programme will be achieved through the following:

- Project work is a significant part of the programme, where technical elements are integrated with problem solving, focusing on application and practical engineering. Through project work emphasis is placed on developing the students' technical, methodological, communicational and personal qualifications.

- Co-operation with scientific research communities and companies throughout the programme

- An international study environment, where parts of the degree programme can be completed abroad and where all courses are taught in English for both Danish and foreign students

- Using the student's internship actively to create an interchange of knowledge and experiences between VIA and the professional environment

- The application and practice related qualifications are primarily obtained by using the facilities such as laboratories, manufacturing workshops and the Library at VIA.

2 Degree programme structure

2.1 Outline of the degree programme structure

New full degree students are admitted once a year in August. Exchange students may be admitted in August or February, as well as credit transfer students.

The official duration of the degree programme is 3½ years divided into 7 semesters corresponding to 210 ECTS credit points.

The scope of each course and project is documented in ECTS credit points (European Credit Transfer System). 1 ECTS credit point corresponds to 27.5 hours of standard study activity for a student and one study year equals 60 ECTS credit points.

A course may have a scope of 4 to 12 ECTS credit points, and a project may have a scope of 6 to 20 ECTS credit points.

For each course or project a course description will inform of:

- Main purpose
- Course topics
- Knowledge, skills and competences required
- Literature used
- Prerequisites for following the course or project
- Assessment

All prerequisites stipulated in the course description have to be complied with before the student may take the course or do the project.

The course descriptions are available on www.viauc.com and on Studynet and in this curriculum in section 12.

For compulsory projects and the bachelor project special guidelines have been made.

The degree programme is scheduled as illustrated below[1]:

7th Semester 30 ECTS Theme: Specialisation and Bachelor Project						
4 Elective course	4 Elective course	4 Elective course	18 ME-BPR2 Bachelor Project			
6th Semester 30 ECTS Theme: Specialisation and Internationalisation						
4 Elective course	4 Elective course	4 Elective course	4 Elective course	4 Elective course	2 ME-BPR1 Prep. Bachelor Project	8 ME-SEP6 International Project Personal Qualifications Management and Project Management
5th Semester 30 ECTS. Theme: Engineering internship in a Company						
4th Semester 30 ECTS Theme: Business-Oriented Development						
4 ME-TER1 Thermo-dynamics	4 ME-FEM1 Finite Element Method	4 ME-OOQ1 Operational Quality Manage-ment and Environ.	4 ME-ECE1 Economics for engineers	6 ME.-EEX1 Engineering experiments Lab Testing Lab Measurement Statistics		8 ME-SEP4 Semester Project 4 Business-Oriented Development Interdisciplinary Project method 4 Theory of Science Project Management
3th Semester 30 ECTS Theme: Machine System Design, Dynamics and Dimensioning						
4 ME-DYN2 Rigid Body Dynamics	4 ME-MAT2 Linear Algebra and introduction to Numerical Programmin g	10 ME-MDI1 Machine Dimensioning Electric motors AC and DC Mechanic Transmissions Hydraulics, Pneumatics Choice of drive systems		4 ME-INN1 Innovation Weeks		8 ME-SEP3 Semester Project 3 Machine System Design, Dynamics and dimensioning Project Method 3 Innovative Processes
2nd Semester 30 ECTS Theme: Engineering Focussing on Analytical Methods 10 ESC M1						
10 ME-ESC1 Engineering Science 1 Particle dynamics Mathematics		8 ME-MME1 Mechanics, Materials and Element Calculation Strength of materials, Materials science Machine Element Calculation, FEM Analysis in Inventor		4 ME-ELT1 Electrical Technology		8 ME-SEP2 Semester Project 2 Engineering Focusing on Analytical Methods Project Methods 2 Project Planning
1nd Semester 30 ECTS Theme: Product Development and Design of Mechanical Equipment						
6 ME-MEK1; Mechanics Statics, Strength of materials Mathcad Machine Element Calculation	4 ME-MTR1 Materials	4 ME-TEC1 Technological Processes	10 ME-PTD1 Product Development and Technical Design Graphic Presentation; Design; 2d/3d-CAD; Product Development; Machine Element			6 ME-SEP1 Semester Project 1 Product Development and Design of Mechanical Equipment Project Method 1 Presentation

[1] This degree programme is valid for students enrolled in 2013, 2014, 2015, 2016

The degree programme consists of:

- Compulsory courses and projects (see section 2.2)
- Internship (2.3)
- Elective courses (2.4)
- Bachelor project (2.5)
- Workshop training (2.6)

2.2 Compulsory courses and projects

All courses and projects in the first four semesters are compulsory.
The compulsory courses are:

1. semester: Mechanics; Materials and Technological Processes; Product Development and Technical Design;
2. semester: Engineering Science 1; Mechanics, Materials and Element Calculation; Electrical Technology
3. semester: Engineering Science 2; Machine Dimensioning; Innovation Weeks
4. semester: Thermodynamics; Finite Element Method; Engineering Experiments; Laboratory Measuring; Operational Quality Management and Environment.

Course descriptions are in section 12.1

Semesters 1, 2, 3, 4, 6 include a semester project of 6 to 8 ECTS credit points. The overall purpose of the semester project is to connect the different courses of the semester. The theme of each semester is as follows:

1. semester: Product Development and Design of Mechanical Equipment
2. semester: Engineering with Analytical Methodologies
3. semester: Machine Design, Dynamics and Dimensioning
4. semester: Business-Oriented Development
6. semester: International Project

Project methodology, philosophy of science, research skills and team work will be introduced throughout the degree programme in connection with the semester projects.

2.3 Internship

The internship comprises one semester equalling 30 ECTS credit points. It is placed in the fifth semester of the degree programme and can be salaried or unsalaried work in a public or private company in Denmark or abroad.

As a prerequisite for commencing the internship, the courses in the first four semesters must be passed. In certain cases, it may be permitted that a student has one course in the third or fourth semester to be incomplete.

The aim of internship is for the student to gain insight into practical engineering combined with integrated use of the concepts, methods and techniques acquired during the first four semesters.

The students are responsible for finding internship which must be approved by VIA.

During the internship, the student will follow a member of staff in the company, who is trained in mechanical engineering. This member of staff will also be the contact person for VIA. The contents of the internship will be planned in accordance to the tasks of a recently graduated mechanical engineer.

A supervisor from VIA is assigned to the student. Students who are in an internship in Denmark may expect one visit from the supervisor during the placement.

In cooperation with the company the student will devise a plan for the internship, including description(s) of assignments, which must be approved by the designated supervisor from VIA. During the engineering internship, the student must maintain continual contact with VIA to report on how the internship is proceeding ensuring an interchange of knowledge and experiences between VIA and the work place.

The internship is assessed as 'passed /not passed'. If the internship is not passed this assessment will be substantiated in writing by the supervisor.
The assessment of the internship will be based on the student's continuous reporting, feedback from the company as well as a presentation where the supervisor may ask questions.

Other than a course description for internship, a number of other information materials have been prepared to guide the students. This is to be found at Studynet.

If the engineering internship is interrupted before termination, the supervisor and the Head of Programme will assess whether the length and content of the internship meet the requirements needed to pass the internship.

2.4 Degree programme specialization and elective courses

Three-degree programme specializations are offered within the areas of 1) Intelligent Mechanics 2) Innovation and Product Design, and 3) Sustainable Energy.

The objectives of each specialization are:

1) Intelligent Mechanics and Systems

New technologies and new navigation systems make it possible to develop self-propelled mine searchers and driverless vehicles etc. Developing intelligent products and systems is about integration between software, system development and machine techniques. You will work with the latest technologies, robots, satellite communication etc.
The keywords are:

- Mechanical vibrations
- Modulation and simulation of mechanical systems
- Control and regulation techniques
- Monitoring systems
- Megatronics
- Measurement techniques and instrumentation
- Strength testing
- Mobile hydraulics
- Optical recognition
- Robots
- Remote control
- Dynamic GPS
- Satellite communication

2) Innovation and Product Design

The ability to be innovative and to convert this ability to results is the key to the future of companies. Innovation must be combined with the development of new products, marketing, economy, design, organization, management and more. Maybe you wish to

start your own company. Regardless of your goal, flexibility, knowledge sharing, the ability to learn and an effective network are all necessary qualities in order to be successful in the global economy. You will be working with the latest technologies in 3D-CAD design, modelling and prototyping.

The keywords are:
- Market research
- Creative processes
- Generating ideas
- Product development
- Visualisation of ideas
- 3D-CAD design and modelling
- Prototype testing
- Strength calculation
- Materials
- Production technologies
- Energy and environment
- Ergonomics
- Management and collaboration
- Business development

3) Sustainable Energy

The entire world's energy production is facing a dramatic shift from coal, oil and gas for energy, not polluting the atmosphere with greenhouse gases. Development of future renewable energy systems is about the energy from solar, wind, waves and CO2-neutral fuels such as straw and wood.

You will work with basic energy engineering, energy conservation, design of energy plants and renewable energy technologies like wind turbines, solar thermal and photovoltaic, biomass and biogas, heat pumps and energy storage, etc.

The keywords are:
- Energy consumption and savings
- Environment and global warming
- Pumps and piping
- Heat transfer and heat recovery
- CHP and district heating systems
- CO2 neutral fuels
- Photovoltaics
- Solar
- Cooling and heat pump technology
- Biogas
- Wave energy
- Windmills
- Strength Calculation and FEM analysis
- Energy storage, hydrogen and fuel cells

On the completion of one of these degree specialization the student acquires the right to a specialization title in the degree certificate. The specialization title is acquired on the following conditions: The bachelor project must be relevant to the specialization title and the student must complete the compulsory specialization elective courses of a minimum of 24 ECTS credit points. That is, a minimum of 44 ECTS points is required to be within

the degree specialization in order for the graduate to obtain the specialization title. Please refer to the VIA website for a list of compulsory and elective specialization courses.

Elective courses are placed in the 6th and 7th semester. Other than elective courses focused on the above mentioned specialization, there are a series of elective courses relevant for the degree in mechanical engineering. The description of each elective course can be seen in the respective course descriptions.
Course descriptions are in section 12.2

Elective courses may otherwise be elected from the range of courses offered by other VIA education programmes. However, this does not include courses with a course content primarily consisting of subjects already covered in the student's previous studies. Any elective courses from other education programmes must be approved by the student counsellor of the Mechanical Engineering Programme to ascertain that the elective courses represent a progressively higher academic level.

2.5 The bachelor project

The bachelor project corresponds to a total of 20 ECTS credit points. The bachelor project must be initiated and prepared in the 6th semester (2 ECTS) and accomplished in the 7th semester (18 ECTS). Normally, the project is worked out in project teams of 2 students.

The bachelor project *must demonstrate independent critical reflection* within the chosen subject and must document the student's ability to apply the theories and methods of engineering. The bachelor project comprises of an independent experimental, empirical and/or theoretical treatment of a practical issue connected to the central themes of the degree programme.

The conditions for initiating the bachelor project are that the student must have passed all the courses and projects in the 1st to 4th semester as well as the engineering internship.

2.6 Workshop training

For students without previous practical prerequisites, the degree programme comprises compulsory workshop training courses. The courses are held concurrently with the basic part of the engineering degree prior to the internship in the tuition free periods or as an integrated part running parallel to ordinary tuition.

Workshop training is assessed as passed/not passed.

2.7 Semester structure

A semester runs over 19 weeks with 15 weeks of tuition and 4 weeks for examination. In the first 12 weeks, courses are held concurrently with the initiation and formulation of the project. The table below shows the typical course of a semester. The number of courses, however, may vary for each semester.

<table>
<tr><td>COURSE 1</td><td rowspan="4">PROJECT</td><td rowspan="4">EXAM</td></tr>
<tr><td>COURSE 2</td></tr>
<tr><td>COURSE 3</td></tr>
<tr><td colspan="2">PROJECT INITIATION AND FORMULATION</td></tr>
</table>

3 Examinations and assessment

3.1 Types of examination

The examination must ensure that the student is tested and assessed on an individual basis. The assessment will take place on the basis of the following types of examination:
1) Written examination
2) Oral examination
3) Oral examination with a project report, a process report and group presentation as basis for individual assessment
4) Approval of active participation after further specified criteria
5) Participation in the internship with continuous reporting
6) Combinations of the above mentioned types of examination 1- 4

The type and duration of examination of each course is stipulated in the course description. It also appears from the exam description whether the exam is conducted individually or in groups. Any prerequisites for taking an exam will also be specified in the course description.

3.2 Examination regulations

- All students are automatically registered for exam when they have been registered for a course
- Once registered for an exam the student cannot withdraw from the exam. If the student does not carry out the exam, it will count as one attempt
- The type of examination/assessment of a course is stated in the course description
- Courses for approval will be assessed approved/not approved without an external examiner cf. section 3.4 concerning criteria for approval
- Elective courses studied at other education programmes require examination, if the course is assessed on the basis of an examination

3.3 External and internal examinations

Examinations will have internal examiner, one or more, or external examiner. At internal examinations VIA will appoint an internal examiner (primarily selected among the teaching staff). At external examinations the examiner will be appointed by the Ministry of Higher Education and Science.

3.4 Assessment and requirements for passing

The following types of assessments will be applied:
1) Graded according to the Danish 7-point scale
2) Passed/not passed are only valid for workshop training and internship

Each course must be passed separately. Courses for which the student attained a grade of 02 or higher according to the Danish 7-point scale or passed cannot be taken again.

Re 1) Grade

The Danish 7-point scale applies. See Ministerial Order no. 114 of 3 Februar 2015 on the Marking Scale and Other Forms of Assessment

Re 2) Passed/not passed
The assessment 'passed/not passed' applies to workshop training courses and internship.

3.5 Extended test time
If the student suffers from language difficulties or any disabilities he/she can apply for special test conditions or extension of the test time.

If the language difficulties are caused by dyslexia, the student must be able to document that he/she has been tested for that. The study counsellor can advise about that.

Application for special test conditions or test time extension should be sent to the department secretary who will assess the application. The application will be accepted if it is assessed to be necessary in order to provide the student with the same conditions as the other examinees, however, only if it will not influence the level of the test.

3.6 Illness
If a student becomes ill on the day of the exam the Study Administration must be informed immediately.

If a student becomes ill during an oral examination the lecturer must be informed.

If a student becomes ill during a written examination the invigilator must be contacted in order to note that the exam has been interrupted due to illness.

The student must consult a doctor on the day of the exam in order to provide documentation of the illness and send it to the department secretary no later than 4 weekdays after the examination. The student has to cover any expenses in this connection.

If illness cannot be documented, it will count as an attempt.

If a student experiences a serious incident which prevents the student in participating in the exam, the student must inform the Study Administration as soon as possible. The department secretary will assess, possibly in collaboration with lecturer, study counsellor or head of programmes, if the rules for illness can also apply to this incident. If this is the case, the attempt will not count.

4 Restudying, re-examination, time limits

4.1 Restudying
Courses or projects which were not passed at an examination may as a rule be restudied again through self-studies. The student may, after approval from the head of programmes, as an alternative follow the course again.

4.2 Re-examination
Re-examinations will ordinarily be held in the subsequent ordinary examination period. If a course or a project is only offered once a year, a student who failed an examination may be given the option to sit for re-examination in the re-exam period during the t 2nd and the 3rd week of the following semester.

For students who are in their final semester the following applies: Students who only need to pass one single examination, which according to the curriculum is placed in the coming ordinary examination period, can opt to sit for a re-examination around two weeks after the next semester starts.

If a course is failed, the student is automatically registered for re-examination. Once registered for re-examination the student cannot withdraw from the re-exam.

A student may take an examination in the same course or project a maximum of three times. These three attempts must follow each other consecutively, i.e. in subsequent semesters. In exceptional cases VIA may grant permission for a fourth and maybe even a fifth attempt.

A re-examination in a course which ordinarily has a written examination may be done as an oral examination.

Re-exam for courses for approval can be arranged as an oral or a written exam instead of the student participating for the second or third time in the course. In such cases VIA will select an examiner among its teaching staff.

If a student fails a project exam with the grade 00, the student may get the opportunity - subject to the decision of the examiner - to choose between 2 options:

1. To make a new project and participate at a new exam. The full grading scale will be used
2. To make written improvements to the project as defined by the supervisor and examiner. If approved the grade will be 02

4.3 Time limits

For the completion of the study programme the following time limits apply:

- 1st and 2nd semester courses and projects must have been passed no later than two years after the student began the degree programme
- 3rd and 4th semester courses and projects must have been passed no later than four years after the student began the degree programme.
- The entire degree programme must have been completed no later than seven years after the student began the degree programme.
- No later than at the end of 2nd semester after starting the degree programme the student must have passed at least one exam to be able to continue the degree programme

If these time limits are not observed the student will be excluded from the study programme.

VIA may, in certain cases, make exemptions from these time limits.

4.4 Commencement of studies exam

All new students who are admitted at 1. semester must participate in and pass a commencement of studies exam in order to be allowed to continue on the programme. This exam is held latest 4 weeks after semester start.

The commencement of studies exam is assessed by internal examiners, and is assessed as Approved or Not approved.

Students who fail this exam may attend an oral re-exam within 14 days from the date of the exam. The students are not allowed more than these two attempts.

The commencement of studies exam is not covered by the rules on examination appeals.

In the event of illness, or if special circumstances apply, the institution may grant exemptions to individual students from the time limits stipulated for passing the commencement of studies exam.

5 Disturbing behaviour and cheating in exams

It is considered cheating when an examinee during exams

- gets unduly help or
- helps another examinee with answers or
- makes use of help other than permitted

Particularly about cheating by plagiarism

Plagiarism is considered cheating if it is found in a submitted paper during an exam and it applies in the following situations:

- a written product that is or has been submitted for assessment, for instance a bachelor project or a weekly assignment
- a written product that is going to be or has been part of the assessment in an oral exam – for example a paper that serves as a prerequisite for signing up for and participating in the oral exam
- a written product that is handed in as prerequisite for signing up for and participating in the exam

When is it considered as plagiarism?

It is considered plagiarism when a student tries to give the impression of being the originator of an idea, a text, a layout etc. in a written assignment when the originator is another person. It is especially considered plagiarism if an assignment entirely or partially appears as being produced by the student/s itself/themselves, even if the assignment

1. includes identical or almost identical reproduction of formulations or work of others when the reproduced parts are not marked with quotation marks, written in italics, indented or with another distinct indication of source references, including page numbers or the like (cribbing/copying).

2. includes substantial passages with a choice of words that are so close to another printed medium, that when compared it is obvious, that the passages could not have been written by the student without using the other printed medium (to paraphrase etc.)

3. includes the use of words or ideas of others without making references or giving credit to the originators (other kind of plagiarism),

4. re-use text and/or central ideas from one's own work that has earlier been through an assessment or earlier published works without taking the above-mentioned points into consideration.

5.1 Disturbing behaviour during tests and exams

VIA has the authority to remove an examinee from a test or exam if the examinee is displaying disturbing behaviour, for example if the examinee is noisy or breaking the institution's code of conduct during exam. In less serious incidents VIA will first issue a warning. The examination monitors will report the incident to the Head of Programme.

5.2 Procedures for cheating in exams and disturbing behaviour

Anyone who has a presumption of cheating is obligated to follow up on the suspicion and – if the presumption is maintained – to report it to the Head of Programme.

If the presumption of cheating in an exam is strengthened, the internal examiner and/or the external examiner must report the incident in writing to the Head of Programme of the study programme in question. At the same time the internal examiner and/or the external examiner will inform the student that the incident has been reported to the Head of Programme. If an assessment has not been made at the time of reporting, the school report will contain a 'not submitted'-note and an assessment will not be made.

When the Head of Programme receives a report on cheating in an exam, he or she must decide whether to dismiss or proceed with the case.

If the Head of Programme decides to proceed with the case, he or she is responsible for gathering documentation that might be missing and also for inviting the student to a meeting where the student has the possibility to relate to the report.

The student must receive a copy of the report with the invitation which must also contain information about the meeting that is about a presumed cheating in an exam and that the student is allowed to bring an assessor to the meeting. The assessor can counsel the student during the meeting, but cannot participate in the conversation. If it is not possible to organise a meeting, written communication must be used.

If the case is dismissed by the Head of Programme, the assessment will take place in the usual manner, if it has not already been made.

5.3 Sanctions for cheating in exams and disturbing behaviour

On the basis of the report and the meeting the Head of Programme will decide whether or not it is an incident of cheating in exam and also decide what type of sanction or penalty should be used against the student. The Head of Programme can only decide on sanctions or penalty if the incident, from his or her perspective, is beyond any doubt a case of cheating in exam.

The circumstance is reported to the Director of School of Technology & Business if - and only if – the incident is of serious nature that it ought to lead to suspension or expulsion from the educational institution. In all other cases the Head of Programme makes the decisions.

The student is informed of the final decision in writing. The person who reported the incident and the student counsellor will receive a copy – and a copy is added to the student's folder.

Provided that cheating in exam is proved, one of the following penalties will be used:

- Warning

- Suspension from written exam on the premises of the educational institution, if a violation of the exam regulations has taken place. If that is the case, the student will be registered as 'absent' from that particular exam.

- Cancellation of a written paper
  The cancellation includes the written assignment where the cheating has been observed. The cancellation can happen even if an assessment has been made. It will be noted that the student has been unsuccessful in an exam attempt.
  A repeated exam attempt with unduly help or non-permitted aids will result in permanent expulsion from the study programme.

- Expulsion or suspension from the study programme
  If the incident is a case of serious or repeated cheating, the student will be expelled or suspended from the educational institution. The expulsion means that the student is excluded from participating in all activities at VIA, including all participation in classes and exams. The suspension entails that the student is excluded from participating in all activities at VIA, including all participation in classes and exams in the suspension period.
  In the case of suspension, the student is registered as being on leave of absence during the period in question. After the suspension period, the student is automatically readmitted as a student at VIA at the study programme.

Apart from the above mentioned penalties, the incident may be reported to the police if it concerns civil law.

6 Exam complaints

Complaints can be submitted in the following circumstances:

- The basis of examination; exam questions, tasks and in relation to educational goals and requirements
- Examination procedure
- Review/result of the exam

The complaint must be in writing and reasoned/justified and individually submitted by the student no later than 14 calendar days after the student is informed of the result of the exam.

The complaint must be sent to the Head of Programme who will manage and evaluate it. The student is entitled to receive a copy of the assignment given by the institution and a copy of the student's submitted assignment in the case of a written exam. As a rule, the Head of Programme presents the complaint to the original adjudicator: internal and external examiner. The examiners have 2 weeks to submit their professional opinion to the student's questions. The student must be given the opportunity to comment on the

professional opinions and has one week to reply.

The Head of Programme determines the outcome of the complaint based on the comments and the opinions. The decision must be written and substantiated and the result may be as follows:

- Re-assessment. Except for oral examination
- Re-examination or
- The complaint is dismissed

The adjudicators must be in agreement, if the appeal is dismissed by the Head of Programme.

The student must be informed as soon as the decision has been made. If the result is a Re-examination or a re-assessment, this can result in a lower grade.

Re-examination or re-assessment

An offer of re-examination or re-assessment must be accepted no later than 2 weeks after the student is informed of the decision. An acceptance hereof cannot be withdrawn.

Re-assessment or re-examination shall not be conducted, if the deadline is not respected.

In the case of re-examination and re-assessment, new examiners will be assigned.
If the result of a complaint is re-examination or re-assessment, the decision applies to all examinees if the original exam is equally inadequate to the former.

Particularly about re-assessment

In the case of re-assessment, the examiners must have the files submitted: Exam questions or assignment, exam paper, the complaint, the original examiners' opinions including comments from the student and the decision from the institution or the Ministry. The examiners will inform the educational institution of the result of the new assessment, including a written evaluation of the assessment. The educational institution will inform the student about the assessment and the evaluation hereof.

Examination questions formulated by the Ministry

The educational institution will immediately forward its own evaluation as well as complaints regarding examination questions, formulated by the Ministry of Higher Education and Science, to the aforementioned ministry.

Appeal of the decision

In case the student disagrees with the decision, he/she has the opportunity to lodge an appeal against the decision no later than 2 weeks after being informed of this decision. The appeal must be in writing and substantiated and sent to the Head of Programme, who will appoint an appeals board.

Particularly about appeals board

The Head of Programme will appoint an appeals board as soon as possible after the submission of the appeal. Permanent appeals boards can be appointed. VIA will defray the cost of the appeals board. The board consists of two external examiners, an examination eligible teacher and a student in the subject area.

About the selection:

- The president of the corps for external examiners will designate the two external examiners and designate one of them as president of the board. The president can designate himself as external examiner or as president of the board.
- VIA will designate the examination eligible teacher and the student.

The appeals board is covered by the Law of Public Administration, including conflicts of interests and confidentiality.

All members of the board must participate in board discussions and receive all documents for the board to be quorum. The discussion can be in writing and digital if there is consensus among the board members of a written process. If consensus among the board members cannot be reached, the discussion will terminate at a meeting where all members must be present. If the discussion ends by voting and there is a tie, the vote of the president is decisive. If the board is aware of errors of an exam during the process, VIA must be informed hereof and VIA will decide how to correct the error in accordance with the Executive Order no. 1519 of 16 December 2013.

The appeals board's decision

The material which formed the basis for the initial decision is the basis for the new decision made by the board. The decision made by the board must be in writing and substantiated and may result in the following:

- Re-assessment. Except by oral examination.
- Re-examination or
- The complaint is dismissed

The Head of Programme must be informed of the decision by the board as soon as possible. In the case of a winter exam, no later than 2 months and in the case of a summer exam, no later than 3 months after the Head of Programme has been informed.

VIA must inform the student as soon as possible if the process of the appeal cannot be completed before the deadline. The information/message must be in writing and substantiated and include information about the expected date of completing the process of the appeal. The Head of Programme will inform the student as soon as possible and the examiners will receive a copy of the decision when the decision has been made. If the decision includes re-examination or re-assessment, this may result in a lower grade.

Re-examination and re-assessment will take place as described in the previous section " Re-examination and re-assessment".

The professional decision of the appeals board cannot be appealed any further.

Appeals of legal issues in decisions made by the adjudicators and the board of appeal may be sent to VIA. The deadline for submission of an appeal is two weeks from the day the decision is announced to the complainant.

Complaints of legal issues in the decisions made by VIA may be submitted to the Ministry of Higher Education and Science. The complaint is sent to VIA, which makes a statement that the student should have the opportunity to comment within a period of usually 1 week. VIA forwards the complaint, statement and any comments to the Ministry. The

deadline for submission of a complaint to VIA is 2 weeks from the day the decision is announced to the complainant.

7 Leave of absence

It is possible to apply for leave of absence from the study programme in accordance with executive order no. 248 of 13th March 2015 on admission to bachelor programmes. All applications must be forwarded in writing to the Head of Programme and will be assessed individually.

The following is applicable:

- Leave of absence cannot be granted until the exams of the first year have been passed (at least 60 ECTS credits)
- Leave of absence is usually granted for the entire semester (e.g. maternity leave and leave of illness may be exceptions) and one full year is recommended if the leave of absence is awarded within the first two years of study
- During leave of absence, the students are considered non-active as regards SU and the calculation of the study period
- Leave of absence can, with justification, be granted for up to two semesters.
- In case of unusual circumstances, leave of absence may be granted for up to four semesters
- After completed leave of absence, the students will be re-admitted under the curriculum in effect
- During leave of absence the student cannot participate in tuition or exam at the programme, from which the student has leave of absence

8 Credit transfer regulations

The student is obliged to inform VIA about passed courses, educational elements from other institutions or other activities, which can be assumed to release credit transfer.

8.1 Workshop practice

Students with at least two years of relevant practical education are exempt from the workshop practice stipulated in section 2.6. The student may also be exempt if the student is able to document that he or she has acquired sufficient knowledge of workshop practices in other ways. The application stating reasons for exemption including documentation for the knowledge acquired about workshop practices should be sent to the Head of Programme who will make a decision about whether the student may be granted partial or complete exemption.

8.2 Internship

Students with a relevant vocational education may in special cases apply for exemption for parts of or the entire internship requirement. The exemption will only be granted if the student can provide documentation of the acquisition of sufficient experience with practical mechanical engineering work. The application stating reasons for exemption including documentation for relevant mechanical engineering work experience should be sent to the Head of Programme who will make a decision about whether the student may be granted partial or complete exemption.

8.3 Higher Technical Education
Production technologists and other students with a higher technical education within the field of machinery, who comply with the theoretical admission requirements of this degree programme can be granted exemption from the entire first semester as well as the internship, corresponding to a total credit transfer for one year. However, the internship can only be exempted if the student has completed a bachelor project in cooperation with a company.
In case of an application for additional exemption, this will be assessed individually.

8.4 Students from the Master in Science of Engineering
Students who have completed the first two years of the Degree in Science of Engineering with a content relevant for mechanical engineering can obtain a credit transfer for these study years and thus an exemption from the first four semesters of this degree programme, excluding the workshop training. Students with another scope of relevant study elements from the Degree in Science of Engineering can receive credits based on an individual assessment.

8.5 Students from other institutes of higher education
Students who have passed courses or other elements of a degree programme at a Danish institution of higher education may on the basis of an individual application get credits for such courses or elements which are relevant to the degree programme at VIA.

8.6 Studies abroad
Students who have studied at a university or an engineering college abroad according to an agreement with VIA will receive credits for passed courses on an individual basis. In entering a prior recognition of courses the student will give consent that VIA can obtain information in order to give credit transfer.

9 Professional title and issue of diploma

Graduates who have completed the degree programme according to this curriculum are entitled to use the title Bachelor of Engineering, with the specification Mechanical Engineering. The Danish title is: Diplomingeniør with the specification Maskiningeniør, as well as the title Professionsbachelor i ingeniørvirksomhed.

If the degree programme comprises 44 ECTS credit points (including the bachelor project) in one of the degree programme specialization the graduate acquires the right to a specialization title within Intelligent Mechanics and Systems, Innovation and Product Design, or Sustainable Energy dependant on the chosen degree programme specialization (see section 2.4).

On completion of the degree programme VIA will issue a diploma which stipulates the title, any specialization title as well as the results attained for assessment. The diploma will also include information about the subject of the bachelor project. Similarly, the diploma will state the basis on which the graduate was originally admitted to the degree programme.

In cases where a student discontinues the degree programme VIA will issue documentation of the courses and other degree programme elements which have been passed.

10 Exemptions

VIA may grant exemptions from the regulations in this curriculum which were set by VIA provided that the student is able to document that circumstances are extraordinary.

11 The commencement of the curriculum

This Curriculum for the Bachelor of Engineering in Mechanical Engineering Programme is valid for students enrolled in August 2013 and after.

12 Course descriptions

12.1 Compulsory courses

12.1.1 Semester courses 1st semester 30 ECTS

12.1.1 a

Statics and Strength of Materials, ME-MEK1	
Title:	Statics and Strength of Materials
Code:	ME-MEK1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Lars Pedersen
ECTS-point:	6
Prerequisites:	Admission requirements
Internal prerequisites:	
Main purpose:	To provide the student with the basic skills to solve static engineering problems.
Key words:	Statics, strength of materials, design (sizing) of mechanical elements.
Topics:	Statics: • Basic principles of mechanics of statics • Force systems o Forces, moments, couples and resultants in 2D o Introduction to 3D • Equilibrium o Supports, system Isolation in 2D o Free-body diagram and equilibrium in 2D o Introduction to 3D • Structures o Method of joints used in plane trusses o Method of sections used in plane trusses o Frames and machines • Distributed forces o Centre of areas o Beams - external effects o Beams - internal effects o Diagrams of normal-force, shear-force and bending moment. o Loading, shear-force, and bending moment relationship • Friction o Types of friction o Dry friction, static and kinetic friction Strength of materials (basic level): • Stress limits of materials, Hookes Law • Section constants o Moment of inertia, polar moment of inertia

	○ Section modulus • Stresses, basic level ○ Normal stress from normal force and bending moment ○ Shear stress from torsion and shear-force (average). ○ Von Mises stress ○ Allowable stress, safety factor. Design(sizing) of machine elements: • Design (sizing) of beams and dynamically loaded shafts (pre dimensioning) • Sizing keys in shafts • Sizing pin connections
Knowledge:	The student will gain knowledge about how to establish a free body diagram from a real life structure and simplify it to a degree where ordinary solution methods can be applied. Furthermore, the student will be able to define the stresses in simple geometries under well-defined loading conditions.
Skills:	The student will be able to set up free body diagrams, calculate reactions and internal forces in simple 2D and 3D structures that are statically determinate. The student will have a basic knowledge about stresses which will enable the student to design simple structures.
Competences:	The student will after the course have gained the competences to design simple structures as well as being part of projects with simple design tasks.
Teaching methods and study activities:	Workload for the student is expected to be 165 hours. The teacher assisted lessons will consist of lecture followed by working with problems in the classroom with teacher assistance. It is expected that students, between lessons, read the literature used and solves problems in groups.
Evaluation:	
Examination:	Examination attendance requirements:
	None
	Type of examination:
	Individual oral examination based upon a subject found by draw. No preparation
	Allowed tools:
	Course literature according to the course description
	Internal/External censorship:
	Internal
	Additional comments:
	The examination papers are handed out at least one week before the exam. Only use of the given textbook is allowed for the exam.
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Lectures and tests performed with scheduled lessons and exams. In total 55 hours, corresponding to 33 %
	Category 2: Initiated by the teacher with the participation of students
	• Problem solving individually and in groups • Reading the literature and other preparation for classes. • Evaluation of teaching and exam preparation In total 95 hours, corresponding to 58 %
	Category 3: Initiated by students, with the participation of students
	• Self-study activities, own literature search, additional study group activities and own additional preparation for classes and exams. In total 15 hours, corresponding to 9%
	Category 4: Initiated by students, with the participation of teachers
	In total 0 hours, corresponding to 0%

Resources:	Required: • Meriam, J. L.; Kraige, L. G.; Engineering Mechanics Statics, SI edition; Wiley; Latest edition. • Fisher, et. al.; Mechanical and Metal trades Handbook, English edition; Europa Lehrmittel, Latest edition. • Lecture notes.
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Compulsory course for Mechanical Engineering; 1st semester

12.1.1 b

Materials Science, ME-MTR1	
Title:	Materials Science
Code:	ME-MTR1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Liliana Persson
ECTS-point:	4
Prerequisites:	Admission requirements
Internal prerequisites:	
Main purpose:	The main purpose is to enable the student to select relevant ferrous materials on the basis of material properties. It is central that the student tests theory in practice through laboratory work to gain a deeper understanding of science issues.
Key words:	Material Science, steel, cast iron, testing of materials, heat treatments
Topics:	Material Science: • Steel and cast iron • Heat treatment of steel • Testing of materials • Deformation and fracture in tension-loaded materials
Knowledge:	The student must gain knowledge about: • Steel and cast iron • Heat treatment of steel • Test methods • Deformation, stresses and fracture in tension-loaded materials
Skills:	Upon completing the course, the student is expected to possess the required skills to: • Select a suitable material for the manufacture of components in steel or cast iron • Identify and describe a suitable heat treatment of steel • Carry out common test methods for materials • Explain the relation between deformation, stresses and fracture in tension-loaded materials
Competences:	Upon completing the course, the student is expected, within the framework of the course, to: • Participate in development tasks covering the design and/or evaluation and improvement of steel and cast iron items • .Furthermore, the student should be capable of seeking, validating and implementing additional knowledge within the subject, on his or her own.
Teaching methods and study activities:	Lectures, group work, assignments, laboratory work. The work load for each student is app. 110 hours. The number of taught lessons is 52 during a period of 13 weeks.
Evaluation:	
Examination:	Examination attendance requirements:
	Completed and approved laboratory work.
	Type of examination:
	Individual oral examination based upon a subject found by draw. No preparation.
	Allowed tools:
	The teacher will provide the course literature/book for the student during examination
	Internal/External censorship:
	External
	Additional comments:
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Tuition, scheduled lessons – 39 hours (4 lessons/week x 13 weeks) • Laboratory work • Exam

	In total about 42 hours, corresponding to 38%
	Category 2: Initiated by the teacher with the participation of students
	• Group work • Preparation for lessons and exam • Evaluation of lessons In total about 16 hours, corresponding to 15 %
	Category 3: Initiated by students, with the participation of students
	• Self-preparation for lessons and exam • Self-study activities • Searching for literature In total about 52 hours, corresponding to 47 %
	Category 4: Initiated by students, with the participation of teachers
	In total 0 hours, corresponding to 0 %
Resources:	Material Science: Callister, William D. and Rethwisch, David G., 2012, Fundamentals of Material Science and Engineering, 4th edition. Hoboken NJ: John Wiley & Sons, Inc.
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Compulsory course for Mechanical Engineering; 1st semester

12.1.1 c

Technological Processes, ME-TEC1	
Title:	Technological Processes
Code:	ME-TEC1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Torben Almskou
ECTS-point:	4
Prerequisites:	Admission requirements
Internal prerequisites:	
Main purpose:	The main purpose is to enable the student - from a designer's point of view – to select relevant processing technologies taking into account time, cost and production volume. It is central that the student tests theory in practice through laboratory work to gain a deeper understanding of technological processes.
Key words:	Technological processes, sintering, welding, processing
Topics:	Technological processes: • Bulk deformation • Sheet-metal forming • Joining and fastening • Material removal • Metal casting • Powder metallurgy & sintering • Design for manufacturing including choice of process and cast calculations.
Knowledge:	Technological processes: • Bulk deformation • Sheet-metal forming • Joining and fastening • Material removal • Metal casting • Powder metallurgy & sintering • Design for manufacturing including choice of process and cast calculations.
Skills:	Upon completing the course, the student is expected to possess the required skills to: • select suitable technological processes based upon production volume, surface requirements, tolerance requirements, load situation etc. • account for the function of different types of production equipment • estimate the cost price of products
Competences:	Upon completing the course, the student is expected -within the framework of the course - to: Participate in development tasks covering the design and/or evaluation and improvement of steel items. Furthermore, the student should be capable of seeking, validating and implementing additional knowledge within the subject on his own.
Teaching methods and study activities:	The work load for each student is app. 120 hours. The number of taught lessons is 48 during a period of 13 weeks.
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory course activities completed
	Type of examination:
	Individual oral examination without preparation based upon course assignment(s)
	Allowed tools:
	All
	Internal/External censorship:
	External
	Additional comments:
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1:

	Initiated by the teacher with the participation of teachers and students
	Teaching of scheduled lessons – 39 hours (4 lessons/week x 13 weeks) • Excursions • Project counselling • Laboratory work – 2 hours • Exams, tests – 1 hour In total 42 hours, corresponding to 38%
	Category 2: Initiated by the teacher with the participation of students
	Solving assignments, self-study – 15 hours • Project work and group work • Preparation for lessons and exams • Evaluation of lessons – 1 hour In total 16 hours, corresponding to 15%
	Category 3: Initiated by students, with the participation of students
	Individual preparation for lessons and exams – 12 hours • Project work • Self-study activities – 39 hours • Study groups • Searching for literature – 2 hours In total 52 hours, corresponding to 47%
	Category 4: Initiated by students, with the participation of teachers
	In total 0 hours, corresponding to 0%
Resources:	Kalpakjian, Serope and Schmid, Steven R., 2008, Manufacturing Engineering and Technology 7th edition SI Version. Upper Saddle River, NJ: Pearson Education, Inc. Mechanical and Metal Trades Handbook, 3rd English version
Additional information:	Issued notes.
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Compulsory course for Mechanical Engineering; 1st semester

12.1.1 d

Product Development and Technical Design, ME-PTD1	
Title:	Product Development and Technical Design
Code:	ME-PTD1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Inge Lundrup
ECTS-point:	10
Prerequisites:	Admission requirements
Internal prerequisites:	
Main purpose:	The course main purpose is to provide the student with the knowledge, methods and analytical tools within the fields of technical drawing and practical use of 3D-CAD programs and machine components.
Key words:	Graphical communication, machine elements, concept development, selection of methods, mechanical design.
Topics:	Graphical communication/mechanical design – 50%: • Double orthogonal projection • Unfolding • Isometric view • Sketching • Drawing according to DS/ISO128 and DS/ISO 129 • Surface characteristic, indicating surface roughness • Welding symbols • Drawing system (layout, the main assembly drawing, partly assembly drawings, detail drawings, parts lists) Machine elements – 20%: • Dimensional tolerances and fits (tolerance system, choice of tolerances/fits, GD&T) • Bearings (types, life calculation, built-in-tolerances) • Transmission - belt and chain drives • Standard Parts (screws, washers, nuts, springs, etc.) CAD – 30%: • Introduction to 3D-CAD (Siemens NX) and 2D drawing
Knowledge:	The student will acquire knowledge in the following fields: • Graphical technical drawings according to mechanical engineering standards. • The function and use of selected mechanical components.
Skills:	The student will gain the following skills: • Graphical representation techniques 2D and 3D – by hand and via 3D CAD. • Technical drawing fundamentals according to (DS/IS 128/129 including the setting of tolerances (Standard and GPS). • The hierarchy of technical drawings for mechanical engineering covering sketching, layout-, part- assembly- subassembly and parts lists. • Identifying and choosing appropriate standard components. • Interpret and use technical information and data in supplier catalogues.
Competences:	Upon completing the course, the student should be able to: • Design a mechanical product on basis of a product specification. • Communicate with suppliers about technical specifications • Produce the documentation needed for production • Communicate with Production regarding means and methods for a mechanical product.
Teaching methods and study activities:	The workload for each student is app. 275 hours. Classroom teaching supplemented with assignments in the various subject areas (drawing-, measuring-, and design tasks). Course assignments.
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory course activities completed Mandatory assignments handed in before deadline and accepted. Test(s) during the course being passed

	Course assignment handed in before deadline CAD test must be accepted
	Type of examination:
	Individual oral examination without preparation based upon course assignment(s)
	Allowed tools:
	None
	Internal/External censorship:
	None
	Additional comments:
	None
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Teaching of scheduled lessons • Theory and assignments solving • Internal tests In total about 98 hours, corresponding to 36%
	Category 2: Initiated by the teacher with the participation of students
	• Solving assignments, self-study • Preparation for lessons • Evaluation of lessons In total about 162 hours, corresponding to 59 %
	Category 3: Initiated by students, with the participation of students
	• Self-study activities, searching for own literature as well as additional preparation for lessons and tests. In total about 15 hours, corresponding to 5 %
	Category 4: Initiated by students, with the participation of teachers
	Total 0 hours, corresponding to 0%
Resources:	• DIN/ISO 128 and DIN/ISO 129 • Mechanical and Metal Trades Handbook (ISBN 13 978-3-8085-1910-3) • Notes (available at VIA Studynet) • FAG rolling bearings – fundamentals, types, designs – TI No. WL 43-1190 • Roulunds transmissions catalogue (available at VIA Studynet) • Siemens NX 10 Tutorial (ISBN 9781511523790) Additional literature: Use of your own laptop.
Additional information:	It is required that the student successfully install the CAD-program provided by VIA on her/his personal computer at the beginning of the semester
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Compulsory course for Mechanical Engineering; 1st semester

12.1.1 e

Semester Project: Product Development and Design of Mechanical Equipment, ME-SEP1	
Title:	Semester Project: Product Development and Design of Mechanical Equipment
Code:	ME-SEP1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Inge Lundrup
ECTS-point:	6
Prerequisites:	Participating simultaneously in other mechanical engineering mandatory subjects offered in the same semester
Internal prerequisites:	
Main purpose:	The course is structured based on a problem-oriented pedagogical model in which efficient peer learnings in group is to be achieved through undertaking an interdisciplinary project. Within the curricular framework based on the product development scheme, the student is guided to choose and formulate problems and questions, which are investigated and analysed using relevant methodologies. The problems are then resolved using the existing sources, relevant methods and theories. The interdisciplinary project must incorporate elements of all 1st semester subjects. The systematic problem solving skills are to be developed in a collaborative teamwork environment. The student is supervised in the documentation process in applying relevant techniques and representations so that the capability of creating a functional communication tool could be developed.
Key words:	Project-oriented, problem formulation, group collaboration, interdisciplinary project, problem analysis, problem solving skills, report writing, documentation.
Topics:	Method and communication: • Note taking techniques • Literature search (introduction to the library search system, handbooks and reference works) • Report writing (working papers, report structure, graphical and linguistic form) • Problem analysis (e.g. needs clarification, problem formulation, sub-problems/questions generation, problem definition, task analysis, stakeholder analysis, resource analysis). • Project planning and execution (e.g. action plan outlining) • Project journal (e.g. meeting documents, plans, resource lists, external materials, inspection reports, working papers, project diary, rules of the group, reflection paper (evaluation of the project process)).
Knowledge:	Upon the completion of the course, the student must be able to: 1. Describe the different project phases from project inception to completion and relate the corresponding activities for each phase. 2. Select a subject/topic related to the courses learned throughout the semester. 3. Outline a project (product) development plan. 4. Generalise the subject related knowledge, methods and theories that are relevant to a specific problem.
Skills:	
Competences:	The student will through the learning process achieve competences to undertake a project in group collaboration through the various project phases including: • Defining a problem • Analysing the problem through methodological reflections; to identify as well as criticize innovative opportunities • Constructing an action plan for project completion purposes • Proposing and generating solutions to the raised questions • Justifying the best solution to the specified problem • Generating comprehensive and concise project outcome documentation that is to function as an efficient communication tool.
Teaching methods and study activities:	1. Final course project: complete one (1) design project in group. The course project forms the basis for the final assessment to the students. 2. Assignment: A few assignments will be given throughout the

	semester for the student to complete in team. 3. Student seminar: Each student is required to present the outcomes of the assignment and course project. The input gathered from the seminar is expected to be applied in the subsequent assignment. 4. Lectures 5. Reading: read the assigned reading before coming to class. 6. Group discussion: A frequent activity for completing assignments given in the lectures. 7. Peer reviewing: Each student needs to actively give feedback to the work of his/her peers presented in the student seminars. 8. Self-assessment: Reflection is a crucial activity for effective learning. Assess his/her own performance in comparison to a given criterion will help to reflect on their own work. 2x 45 minutes per week for 12 weeks. 50% of the lessons are distributed to the final course project execution. Another 50% are to classroom activities including lectures, assignments, group discussions and student seminars.
Evaluation:	
Examination:	Examination attendance requirements:
	To be qualified for the examination, the project and process report must be submitted on time.
	Type of examination:
	Group examination with individual assessment based on the individual´s performance.
	Allowed tools:
	None
	Internal/External censorship:
	None
	Additional comments:
	The group presents the project in 15 minutes, - followed by individual (oral) assessment in approx. 15 minutes. Everyone in the group is present during examination.
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Education, scheduled lessons • Project supervision • Examination In total about 18 hours, corresponding to 11%
	Category 2: Initiated by the teacher with the participation of students
	• Problem solving, self-study • Project work • Preparing for classes and exams In total about 28 hours, corresponding to 17%
	Category 3: Initiated by students, with the participation of students
	• Own preparation for classes and exams • Project work • Self-study activities • Study Groups • Literature search In total about 115 hours, corresponding to 70%
	Category 4: Initiated by students, with the participation of teachers
	• Project meetings In total about 4 hours, corresponding to 2%
Resources:	• Olsen, Poul Bitsch and Kaare Pedersen: • GB: Problem-Oriented Project Work - a Workbook • Miscellaneous notes (delivered via Fronter)
Additional information:	• Witfelt Claus: IT as a project tool. Samfundslitteratur. • Peter Stray Jørgensen: Voice Gifts - speaking to university students. Publisher: Samfundslitteratur 1997.

Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Compulsory Course for Mechanical Engineering; 1st semester

12.1.2 Semester courses 2nd semester 30 ECTS

12.1.2 a

Electrical Engineering, ME-ELT1	
Title:	Electrical Engineering
Code:	ME-ELT1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Per Ulrik Hansen
ECTS-point:	4
Prerequisites:	The admission requirements.
Internal prerequisites:	
Main purpose:	The course is to provide the student with the knowledge of basic electrical theory and methods for circuit analysis. The students will also verify the learned theory through laboratory experiments in order to gain a deeper understanding.
Key words:	Voltage, current, resistance, capacitance, inductance, voltage and current sources, Ohms law, Kirchhoff's laws, DC and AC circuits, circuit analysis, power and energy
Topics:	1. Voltage, current and resistance, Ohms law 2. Capacitors and inductors 3. Voltage and current sources 4. Kirchhoff's laws 5. Analysis of DC circuits 6. AC voltage and impedance 7. Analysis of AC circuits 8. Power and energy 9. Resonant Circuits & Passive Filters
Knowledge:	
Skills:	
Competences:	Upon the completion of the course, the student will be able to analyse DC and AC circuits containing basic active and passive elements.
Teaching methods and study activities:	4 lessons per week for 12 weeks. Lectures, exercise, assignments and laboratory work. The student should estimate a total workload of 120 hours.
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory course activities completed
	Type of examination:
	4 hours written exam
	Allowed tools:
	All
	Internal/External censorship:
	Additional comments:
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	In total 48 hours, corresponding to 44%
	Category 2: Initiated by the teacher with the participation of students
	In total 30 hours, corresponding to 27%
	Category 3: Initiated by students, with the participation of students
	In total 32 hours, corresponding to 29%
	Category 4: Initiated by students, with the participation of teachers
Resources:	

Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	GBE 4th semester; Compulsory for all GBE-Mechanical 2017 Feb-Jun MA 2nd semester; Compulsory for Mechanical Engineering 2017 Feb-Jun ME 2nd semester; Compulsory for Mechanical Engineering 2017 Feb-Jun

12.1.2 b

Engineering Science 1 - Mathematics and Particle Dynamics, ME-ESC1	
Title:	Engineering Science 1 - Mathematics and Particle Dynamics
Code:	ME-ESC1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Uffe Vestergaard Poulsen
ECTS-point:	10
Prerequisites:	Admission to the programme
Internal prerequisites:	
Main purpose:	The course will introduce the student to mathematical methods in general and to the mathematics and physics of particle dynamics in particular.
Key words:	Particle kinematics, basic real functions, polar coordinates, complex numbers, differential equations, space curves
Topics:	Particle kinematics, particle dynamics including the use of energy methods and linear impulse, basic real functions, polar coordinates, complex numbers, differential equations, space curves
Knowledge:	After completing the course, the student will know how mathematics is used in the description of particle dynamics. Basic calculus, 3-dimensional vectors, and differential equations will all be familiar concepts.
Skills:	During the course, the student will gain ability to: • Use principles of calculus on real functions. • Use selected basic mathematical functions. • Use polar coordinates. • Perform algebra with complex numbers. • Solve selected first and second order ordinary differential equations. • Understand and use vectors in 3-dimensional problems. • Analyse space curves given on vector form with parametric equations. • Analyse and solve kinematic and dynamic problems of particles using mathematical methods. • Use a systematic approach in solution of physical problems. • Use a Computer Algebra System (CAS) for solving mathematical and physical problems.
Competences:	After completing the course, the student will be: • Able to solve simple technical problems on the basis of fundamental physical laws. • Familiar with different techniques of stating and solving physical problems. • Capable of reading and interpreting technical literature in which mathematical terms are used.
Teaching methods and study activities:	The activities will alternate between theory, experimental work, independent study, exercises and assignments. 12 weeks with 10 lessons per week. Minimum one week is used for supervision in assignments and course-assignment. For the student a total workload of 275 hours is to be expected.
Evaluation:	
Examination:	Examination attendance requirements :
	• Mandatory course activities completed and accepted • Mandatory assignments handed in before deadline and accepted • Course assignment in particle dynamics handed in prior to deadline and accepted
	Type of examination:
	4 hours written exam
	Allowed tools:
	All
	Internal/External censorship:
	Internal
	Additional comments:
	The written exam is in mathematics.

Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Class room teaching • Mini-project guidance A total of about 90 hours, corresponding to 33 %
	Category 2: Initiated by the teacher with the participation of students
	• Exercises • Assignments • Mini-project • Written exam A total of about 135 hours, corresponding to 50 %
	Category 3: Initiated by students, with the participation of students
	• Self-study • Exam preparation A total of about 50 hours, corresponding to 18 %
	Category 4: Initiated by students, with the participation of teachers
	• A total of 0 hours corresponding to 0%
Resources:	Required: • R. C. Hibbeler: Engineering Mechanics – Dynamics – SI Edition, Prentice Hall. Latest edition. • Robert A. Adams: Calculus: A Complete Course, Prentice Hall. Latest edition.
Additional information:	The student is expected to have a laptop which fulfils the specifications given by the school
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Compulsory Course for Mechanical Engineering; 2nd semester

12.1.2 c

Mechanics, Materials and Machine Elements, ME-MME1	
Title:	Mechanics, Materials and Machine Elements
Code:	ME-MME1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Lars Pedersen
ECTS-point:	8
Prerequisites:	Static and basic level in strength of materials.
Internal prerequisites:	ME-MEK1 or MA-MEK1
Main purpose:	This course will enable the student to choose among corrosion resistant construction materials; to do calculations of stresses, strains and deformations inside materials and to calculate the maximum permissible load of a structure.
Key words:	Materials, strength of materials, mechanics and machine elements
Topics:	Materials: (App. 2 ECTS) Corrosion, stainless steels, aluminium, titanium and plastic materials (thermoplastics, thermosets, composites). Mechanics and Machine Element Design: (App. 6 ECTS) Static moments, centroids, area moments of inertia, parallel axis theorem, stresses and strains in materials, axial load, torsional load, bending, transverse shear, combined load, plane stress with the Mohr diagram, deformation of beams, statically indeterminate structures, buckling of columns, stress concentration, static failure theories, introduction to fatigue failure theories, rotating shafts exposed to dynamic load.
Knowledge:	The student will obtain knowledge about corrosion and corrosion resistant materials and calculation methods of mechanical static and dynamic strength.
Skills:	Upon completing the course, the students will be able to: • Choose constructing material according to strength, elasticity, corrosion, temperature etc. • Calculate centroids of bodies. • Calculate area moments of inertia for plane areas. • Design and approve static loaded structures. • Calculate reactions in statically indeterminate structures. • Calculate deformations of beams by integrating the elastic line equation. • Calculate deformations of beams by use of standard figures. • Calculate for buckling of columns (introductory level). • Design and approve rotating shafts according to subjected dynamic loads.
Competences:	Upon completing the course, the student will be able to design mechanical structures with choice of materials and approval of mechanical strength.
Teaching methods and study activities:	Workload for the student is expected to be 220 hours. The teacher assisted lessons will consist of lecture followed by working with problems in the classroom with teacher assistance. It is expected that the student, between lessons, read the literature used and solves problems in groups.
Evaluation:	
Examination:	Examination attendance requirements:
	Test(s) during the course passed Tests in laboratory
	Type of examination:
	Individual oral examination based upon a subject found by draw. No preparation.
	Allowed tools:
	Course literature according to the course description
	Internal/External censorship:
	External
	Additional comments:
	The Test during the course is within the Materials Science part.

Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	· Lectures and tests performed with scheduled lessons and exams. · Tests in laboratory. In total about 75 hours, corresponding to 34 %
	Category 2: Initiated by the teacher with the participation of students
	· Problem solving individually and in groups · Reading the literature and other preparation for classes. · Evaluation of teaching and exam preparation In total about 120 hours, corresponding to 55 %
	Category 3: Initiated by students, with the participation of students
	· Self-study activities, own literature search, additional study group activities and own additional preparation for classes and exams. In total about 25 hours, corresponding to 11 %
	Category 4: Initiated by students, with the participation of teachers
	In total 0 hours, corresponding to 0 %
Resources:	James M. Gere, Barry J. Goodno; Mechanics of Materials, SI Edition, Latest edition; Cangage Learning. Steven R. Schmid, Bernard J. Hamrock, Bo O. Jacobson, Fundamentals of Machine Elements, SI Version, 3th Edition.
Additional information:	U. Fisher et al: Mechanical and Metal Trades Handbook. Europa Lehrmittel. Latest edition P. Klit et al: Machine Elements, Analysis and Design. Polyteknisk Forlag. Latest edition. Bonnerup & Jensen: Stålkonstruktioner efter EN 1993 (in Danish). Nyt Teknisk Forlag. Seneste udgave. Roloff/Matek: Maschinenelemente (in German) – mit Tabellen Anhang, Friedr. Vieweg. Latest edition. Callister Et Al: Fundamentals of material science and engineering
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Compulsory Course for Mechanical Engineering; 2nd semester

12.1.2 d

Semester Project: Engineering with Focus on Analytical Methods	
Title:	Semester Project: Engineering with Focus on Analytical Methods
Code:	ME-SEP2
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Inge Lundrup
ECTS-point:	8
Prerequisites:	ME-SEP1, ME-PTD1
Internal prerequisites:	
Main purpose:	To develop the ability to work analytically, methodically and organized in collaboration with others through the implementation of projects within product analysis and product development. It is also expected that the student applies the gained knowledge and feedback from the previous semester.
Key words:	Structuring, planning, analytical methods, optimisation
Topics:	Structuring: - WBS - Function tree - Cause-and-effect diagram Planning: - Gantt chart - Network Planning - Resource planning - Capacity Planning - MS-Project Team Work: - Co-operation - Conflict resolution - Group test
Knowledge:	The student will acquire knowledge about structuring and planning tools and collaborative techniques.
Skills:	The student will acquire skills in: – selecting, structuring and planning a project - defining a project in an appropriate manner - choosing suitable methods and models for addressing the project challenges - using collaborative techniques - applying analytical engineering methods for product optimization.
Competences:	The student must be able to: - take responsibility for organizing and implementing a project using skills of structuring, planning and cooperation. - analyse, evaluate and document the problems in a project using relevant engineering theories and methods, primarily within the fields of mathematics, 3D CAD design, machine elements, material science and material strength.
Teaching methods and study activities:	In the first 12 weeks of the semester the students will be taught project planning. In the same period, they will start working on the study project. In the last 3 weeks of the semester, the students will only work on the study project. The workload for each student is 220 hours. The number of taught lessons is 24 during the first 12 weeks. The project work is performed in groups of approx. 4 students. Additional Information: Own laptop shall be used with MS-Project.
Evaluation:	
Examination:	Examination attendance requirements:
	To be qualified for the examination, the project and process report must be submitted on time.
	Type of examination:
	Group examination with individual assessment based on the individual´s performance. The group presents the project in 15 minutes, - followed by individual (oral) assessment in approx. 15 minutes. Everyone in the group is present during examination.
	Allowed tools:

	Internal/External censorship:
	External
	Additional comments:
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Education, scheduled lessons • Project supervision • Examination In total 18 hours, corresponding to 8%
	Category 2: Initiated by the teacher with the participation of students
	• Problem solving, self-study • Project work • Preparing for classes and exams In total 31 hours, corresponding to 14%
	Category 3: Initiated by students, with the participation of students
	• Own preparation for classes and exams • Project work • Self-study activities • Study Groups • Literature search In total 165 hours, corresponding to 75%
	Category 4: Initiated by students, with the participation of teachers
	Project meetings In total 6 hours, corresponding to 3%
Resources:	Internet based literature.
Additional information:	Ålykke, Peter; Optimal use of Microsoft Project 2000. Mikkelsen, Hans & Riis, Jens Ove: Project Management.
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Compulsory course for Mechanical Engineering: 2nd semester

12.1.3 Semester courses 3rd semester 30 ECTS

12.1.3 a

Rigid Body Dynamics, ME-DYN2	
Title:	Rigid Body Dynamics
Code:	ME-DYN2
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Morten Carter
ECTS-point:	4
Prerequisites:	Courses of basic mathematics, statics and particle dynamics must have been passed.
Internal prerequisites:	ME-ESC1, ME-MEK1
Main purpose:	To prepare the student for further studies in mechanical engineering. The student must obtain familiarity with: - the use of moving coordinate systems, i.e. relative motion - kinematics and dynamics of planar motion of a rigid body
Key words:	Planar motion of a rigid body, relative motion, principle of impulse and momentum, equation of rotational motion
Topics:	Planar motion of a rigid body: • Definition of a rigid body • Velocity equation • Acceleration equation • Instantaneous centre of zero velocity • Equation of rotational motion • Principle of impulse and momentum • Work and energy. • Relative motion: • Relative motion in translating reference system • Relative motion in translating and rotating reference system.
Knowledge:	Upon completion of the course, the student will know • the theory of kinematics of planar motion of rigid bodies • the theory of dynamics of planar motion of rigid bodies
Skills:	Upon completion of the course, the student must be able to • use translating and rotating reference systems to describe physics systems • analyse kinematic and dynamic problems of planar motion of a rigid body • use mathematical methods in solving these problems
Competences:	The student shall be able to: • analyse and solve simplified models of mechanical systems involving rotation
Teaching methods and study activities:	5 lessons per week for 9 weeks. For the student a total workload of 110 hours is to be expected.
Evaluation:	
Examination:	Examination attendance requirements:
	None
	Type of examination:
	4 hours written exam
	Allowed tools:
	All
	Internal/External censorship:
	External
	Additional comments:
	None
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Classroom teaching • Examination A total of about 40 hours, corresponding to 36%

	Category 2: Initiated by the teacher with the participation of students
	• Preparation for class • Assignments • Midterm evaluation A total of about 50 hours, corresponding to 45%
	Category 3: Initiated by students, with the participation of students
	• Project • Self-study A total of about 20 hours, corresponding to 19%
	Category 4: Initiated by students, with the participation of teachers
	• A total of 0 hours, corresponding to 0%
Resources:	Required: • R. C. Hibbeler: Engineering Mechanics – Dynamics – SI Edition, Prentice Hall. Latest edition.
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Compulsory Course for Mechanical Engineering; 3rd semester

12.1.3 b

Linear Algebra and Introduction to Numerical Programming, ME-MAT2	
Title:	Linear Algebra and Introduction to Numerical Programming
Code:	ME-MAT2
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Uffe Vestergaard Poulsen
ECTS-point:	4
Prerequisites:	Courses of basic mathematics, statics and particle dynamics must have been passed.
Internal prerequisites:	ME-ESC1
Main purpose:	To prepare the student for further studies in mechanical engineering. The student shall obtain familiarity with: - Linear algebra with focus on mechanical problems, in particular the study of systems of ordinary differential equations - Basics of numerical programming using MATLAB
Key words:	Linear algebra, matrices and matrix algebra, linear transformations, ordinary differential equations, numerical methods
Topics:	Linear Algebra: • Linear systems and matrix reduction • Vectors in Rn • Matrices and matrix algebra • Determinants and Cramer's rule • Linear transformations • Linear dependency • Eigenvalues and eigenvectors • Diagonalization of matrices • Linear systems of differential equations • Matlab: • Plots • Linear equations • Loops • Logical expressions • Functions • Solving ordinary differential equations
Knowledge:	Upon completion of the course, the student will know • basic linear algebra • basic theory of linear systems of ordinary differential equations (ODEs)
Skills:	Upon completion of the course, the student must be able to: • solve systems of linear equations with given coefficients • perform matrix algebraic operations • find eigenvalues and eigenvectors of small matrices • solve linear systems of ODEs with constant coefficients • use MATLAB to perform the above tasks numerically and for plotting
Competences:	The student must be able to: • read texts that make use of linear algebra • read and write simple scripts in MATLAB
Teaching methods and study activities:	5 lessons per week for 9 weeks. For the student a total workload of 110 hours is to be expected.
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory assignments handed in before deadline and accepted.
	Type of examination:
	Individual oral examination based upon a subject found by draw. No preparation
	Allowed tools:
	All
	Internal/External censorship:
	Internal
	Additional comments:
	None

Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Classroom teaching • Examination A total of about 35 hours, corresponding to 32%
	Category 2: Initiated by the teacher with the participation of students
	• Preparation for class • Assignments • Midterm evaluation A total of about 50 hours, corresponding to 45%
	Category 3: Initiated by students, with the participation of students
	• Project • Self-study A total of about 25 hours, corresponding to 23%
	Category 4: Initiated by students, with the participation of teachers
	A total of 0 hours, corresponding to 0%
Resources:	Required: • Notes handed out during the course • MATLAB must be installed (VIA license) on the student's own laptop
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Compulsory Course for Mechanical Engineering; 3rd semester

12.1.3 c

Machine Dimensioning, ME-MDI1	
Title:	Machine Dimensioning
Code:	ME-MDI1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Bo Leander Gylling
ECTS-point:	10
Prerequisites:	Static, science of materials and basic drawing techniques.
Internal prerequisites:	
Main purpose:	The main purpose of this course is for students to acquire the competences needed to design and dimension a simple machine assembly. Students will in some issues test theory in practice through laboratory work/assignment to gain a deeper understanding of science issues.
Key words:	
Topics:	The basics for machine assemblies formed of main components, such as motors and actuators, which works electrically or hydraulically. Properties and dimensional calculation of standard mechanical components such as gears, belts, couplings, clutches and brakes, etc. Function of standard hydraulic components. Simple open hydraulic circuits. Basic magnetics and working principles of electrical machines, focusing on DC and induction motors. Three phase mains systems. Electrical installations and safety, including the selection of protection devices.
Knowledge:	The students will gain the knowledge how simple mechanical and hydraulic machine systems are build, and know the most common machine elements used for such systems.
Skills:	The students will have skills in: Selecting machine elements from product data and dimension the size of these to connect them physically together in to a simple machine system. Calculate/define demands for a simple assembly, based on a given set of physical facts and functional needs.
Competences:	Having completed this course, students should be able to: • **Explain construction and control principles of simple machines.** • **Understand the parameters for choosing machine elements and for design/dimensioning of simple machine assemblies.** • **Interpret and use the catalogue data for main components.** • **Find and compare necessary knowledge and data by web searching.** • **Set up possible solutions for the design of simple assemblies, based on specific demands and criteria.**
Teaching methods and study activities:	10 lessons per week for 12 weeks. Minimum one week is used for supervision in the course examination and repetition. Expected workload for students is 275 hours. Teaching will balance theory and small exercises.
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory course activities completed
	Type of examination:
	Individual oral examination based upon a subject found by draw. Preparation time: 20 minutes.
	Allowed tools:
	All
	Internal/External censorship:
	External
	Additional comments:
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	· Education, scheduled lessons · Examination

	In total 120 hours, corresponding to 44%
	Category 2: Initiated by the teacher with the participation of students
	· Problem solving, self-study · Group work · Preparing for classes and exams · Evaluation of teaching In total 145 hours, corresponding to 53%
	Category 3: Initiated by students, with the participation of students
	· Own preparation for classes and exams · Self-study activities · Study Groups · Literature search In total 10 hours, corresponding to 3%
	Category 4: Initiated by students, with the participation of teachers
	· Debate Events · Study In total 0 hours, corresponding to 0%
Resources:	· Notes given i class · Steven R. Schmid - Fundamentals of Machine Elements · Andrew Parr, Hydraulics & Pneumatics.
Additional information:	· Fischer Ulrich & others, Mechanical and Metal Trades Handbook, Chapter A · Various other literature and materials may be supplied during the course.
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Mechanical Engineering; Compulsory Course for Mechanical Engineering; 3rd semester

12.1.3 d

ME-Study Project 3: Machine System Design, Dynamics and Dimensioning	
Title:	ME-Study Project 3: Machine System Design, Dynamics and Dimensioning
Code:	ME-SEP3
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Bo Leander Gylling
ECTS-point:	8
Prerequisites:	ME-SEP2
Internal prerequisites:	
Main purpose:	- Develop the student's ability to work systematically with problem and project based assignments. - Develop competences in handling group work, discussions and analysis of relevant issues in an international team. - Gain new knowledge in areas of controls and dimensioning of technical machines. - Make students able of running and control projects by use of systematic tools.
Key words:	
Topics:	-Machine design and construction. -Dimensioning in relation and with consideration to both static and dynamic loads. -Selection of machine elements and drive units. -Machine Directive
Knowledge:	Students should out fill the specific unknown knowledge in respect to their project's needs.
Skills:	
Competences:	After the project, the student must be able to; - Make project planning and structure of a group's workflow and cooperation. - Use elementary models and methods in connection with finding and selecting solutions. -Choose and use relevant theories and methods learned from earlier semesters, including circuit theory, dynamics, mechanical transmission and components, in preparation for designing and calculating larger machines. -Evaluate conditions in respect to rules and regulative, such as the Machine Directive. -Design and construction of the chosen solution must be documented with calculations and machine drawings, from sketches and up to finished print-out of CAD-drawings.
Teaching methods and study activities:	The Student's project on 3th semester, with own choice of technical theme. The work is expected to be 220 hours per student. The project should be carried out by groups of preferably 4 students. The project will run parallel with other lessons in the 12 weeks of the semester. In the last 3 weeks, there will be opportunity to work full time on the project. (That means an average workload per week of minimum 10 hours/student in the first 9 weeks). -The activities should be carried out as self-study, with the possibility to get necessary guidance from supervisor. Report: -Project report must be max. 50 pages + appendix. The process rapport, which is a part of appendix, should be max. 10 pages. At project start, the following is used: - 2 lessons of introduction to study project - 2 lessons of introduction to Machine Directive - 4 lessons in project management
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory assignments handed in before deadline and accepted.
	Type of examination:
	Group presentation followed by an individual examination with the presence of the whole group. Duration of presentation will be 15 - 20 minutes
	Allowed tools:
	All

	Internal/External censorship:
	External
	Additional comments:
	Oral examinations indicative influence on final grade: 50%
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	· Education, scheduled lessons · Project supervision · Examination In total 18 hours, corresponding to 8%
	Category 2: Initiated by the teacher with the participation of students
	· Problem solving, self-study · Project work · Preparing for classes and exams In total 14 hours, corresponding to 6%
	Category 3: Initiated by students, with the participation of students
	· Own preparation for classes and exams · Project · Self-study activities · Study Groups · Literature search In total 180 hours, corresponding to 82%
	Category 4: Initiated by students, with the participation of teachers
	· Debate Events · Study In total 8 hours, corresponding to 4%
Resources:	
Additional information:	Litterature… Danish: Hans Mikkelsen og Jens O. Riis: Grundbog i projektledelse. Forlaget PROdevo ApS. Dalum, Susan: Metoder i problemorienterede projekter, Vitus Bering - CVU. English: Poul Bitsch Olsen and Kaare Pedersen: Problem-Oriented Project Work, Roskilde University press.
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Mechanical Engineering; Project; 3rd semester

12.1.3 e

Engineering Innovation	
Title:	Engineering Innovation
Code:	INO I1
Ver.:	1.0
Language:	EN
Offered by:	VIA Engineering
Responsible:	ASBI, MLIP & TOLS
ECTS-point:	5
Prerequisites:	
Internal prerequisites:	
Main purpose:	Students examine the innovator's mind set and explore the culture of innovation. In a real work, hands-on way, students learn how to be innovative and why innovation is integral to business success in the 21st century. Innovation strategies and tactics are evaluated from the perspective of ideation: turning innovative ideas into products (services) that are produced, sold, and serviced in a highly competitive global marketplace. Upon completion of Engineering Innovation, students will have acquired the insight, knowledge tools and skills to compete in the global marketplace as an innovator.
Key words:	Innovation, Creativity, Cross-/inter-/multidisciplinary and Professional identity
Topics:	• Clarifying multidisciplinary group competencies • The history of the engineer and engineering • VIA engineering in an innovative perspective • Field research • Field trip • The 4D model: Discover, iDiate, Design, Deliver • Process reflection • Innovation competition
Knowledge:	After having successfully completed the course, the students will have gained: • An understanding of their own professional identity in and of itself, as well as contrasted and compared to other fields of engineering • An understanding of innovation and its uses within the field of engineering • Knowledge about innovative processes within the field of engineering
Skills:	After having successfully completed the course, the students will be able to: • Engage in innovative processes in a Cross-/inter-/multidisciplinary setting in order to conceive, plan and execute their ideas • Work methodically with innovation • Apply relevant models to the implementation of product and concept development
Competences:	After having successfully completed the course, the students will have gained competences in: • Introducing innovative ideas into project work • Assess when innovation is needed and what the value of initiating an innovative process will be • Contributing own professional skills in teams with the objective of solving problems by using innovative processes and models
Teaching methods and study activities:	Engineering Innovation is a three-week comprehensive course in which the students work partly in their own faculty (one week, see separate description) and partly cross-faculty in VIA Engineering (two weeks): Week 49-50: Working in multidisciplinary groups in VIA Engineering (Monday December 5 – Friday December 16, 2016)

	Throughout the course, the students will work in groups gaining innovative tools and using these for solving specific challenges posed by actual companies. Additional information about the content and scope of the group challenges and deliveries will be announced during week 49. External partners from the companies who posed the challenges assess the students. The students are assessed in terms of their written deliveries and their oral presentation, emphasis being on their idea, the process described for working with the idea, and the final product and/or solution.
Evaluation:	In order to qualify for an approval, the students: Must have an attendance of 100% at the Engineering Innovation during the three-week period. The group's facilitator must approve any deviation or exception from this requirement as well as absence during the three weeks. Every day you will be asked to check-in and out of the class.
Examination:	**Examination attendance requirements:**
	Type of examination:
	Group presentation of project Friday December 16.
	Allowed tools:
	Internal/External censorship:
	Additional comments:
Grading criteria:	Full participation in all activities during the course (check-in/out each day). Approved/not-approved.
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	Category 2: Initiated by the teacher with the participation of students
	Category 3: Initiated by students, with the participation of students
	Category 4: Initiated by students, with the participation of teachers
Resources:	
Additional information:	
Valid from:	24-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	

12.1.4 Semester courses 4th semester 30 ECTS

12.1.4 a

Economics for Engineers, ME-ECE1	
Title:	Economics for Engineers
Code:	ME-ECE1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Martin Møhl
ECTS-point:	4
Prerequisites:	General admission requirements
Internal prerequisites:	
Main purpose:	Enable the students to: Analyse the position of a company. Financial- and market wise in relation to the strategy of the company. Determine means and methods for budgeting, investment and finance. Judge engineering related decisions with regards to their businesswise consequences.
Key words:	accounting, costing, financing, immaterial rights
Topics:	Lectures, class discussions and problem solving - individually and in groups.
Knowledge:	The student will gain knowledge within the following areas: -Company structures -Financial statements -Analysing financial statements -The company's market position -Cost Ratio -Strategy and portfolio management. -Sales optimisation in different competitive environments -Price calculation -Investment -Financing -Budgeting -Immaterial rights
Skills:	Upon completing the course, the student must be able to manage the following: Develop corporate financial statements Describe the company's market and cost conditions Define relevant investment options Define funding opportunities with private and foreign capital Make profit and cash budgets Identify immaterial right issues
Competences:	Upon completing the course the student must be able to manage the following: - Analyse a company's position in terms of financial and market strength. - Judge engineering related decisions with regards to their business consequences. - Analyse corporate financial statements. - Describe and explain the company's market and cost conditions. - Choose among investment options. - Investigate funding opportunities with private and foreign capital. - Make profit and cash budgets and use these as management tools. - Suggest action regarding immaterial rights issues
Teaching methods and study activities:	4 lessons a week for 12 weeks. Theory, task design and course assignments. Minimum one week is used for supervision of course assignments. For the student a total work load of 120 hours must be expected.
Evaluation:	
Examination:	**Examination attendance requirements:**
	Mandatory assignments handed in before deadline and accepted

	Type of examination:
	Written examination. Duration: 3 hours
	Allowed tools:
	Internal/External censorship:
	Additional comments:
Grading criteria:	The Danish 7 – point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Teaching of scheduled lessons • Excursions • Project counselling • Laboratory work • Exams, tests hours 30 %
	Category 2: Initiated by the teacher with the participation of students
	• Solving assignments, self-study • Project work and group work • Preparation for lessons and exams • Evaluation of lessons Hours 40 %
	Category 3: Initiated by students, with the participation of students
	• Individual preparation for lessons and exams • Project work • Self-study activities • Study groups • Searching for literature Hours 20 %
	Category 4: Initiated by students, with the participation of teachers
	• Debates • Study counselling Hours 10 %
Resources:	Poul M. Collier: Accounting for Managers" John Wiley & Sons Ltd, Chichester, England. 4 edition 2012
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	

12.1.4 b

Engineering Experimentation, Measurement Systems and Statistics, ME-EEX1	
Title:	Engineering Experimentation, Measurement Systems and Statistics
Code:	ME-EEX1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Per Ulrik Hansen
ECTS-point:	6
Prerequisites:	Calculus, dynamics, kinematics, statics, mechanics of materials, DC and AC circuit analysis.
Internal prerequisites:	
Main purpose:	The student should plan an experiment, make the experiment, analyse the results and report these according to the international standard GUM. Also, the student should be familiar with basic statistical theories.
Key words:	Experiments in laboratory, measurement, statistics, sensor, transducer, calibration, GUM, DAQ, data acquisition, uncertainty, error, regression
Topics:	· General characteristics of measurement systems · Measurement systems with electric signals · Computerized data-acquisition systems · Discrete sampling and analysis of time-varying signals · Statistics · Statistical analysis of experimental data (including regression) · Experimental uncertainty analysis · Measurement of solid-mechanical quantities and pressure, temperature, humidity and flow and level · Dynamic behaviour of measurement systems · Guidelines for planning and documenting experiments · A major measurement project
Knowledge:	The student can explain engineering experimentation, measurement, statistics, sensor, transducer, calibration, GUM, data acquisition, uncertainty, error and regression
Skills:	The student can use literature, papers and other sources when planning experiments, and demonstrate methodology when planning and making measurements
Competences:	Students can plan experiments, perform measurements, analyse measured data, perform systematic measurements and reduce the risk of mistakes, structure reporting the experiments and make correct conclusions.
Teaching methods and study activities:	30 class lectures, problem solving 30 lessons with a major experimentation project
Evaluation:	
Examination:	**Examination attendance requirements:**
	Course assignment handed in before deadline Tests in laboratory
	Type of examination:
	Individual oral examination without preparation based upon course assignment(s) Individual oral examination based upon a subject found by draw. No preparation Group presentation followed by an individual examination with the presence of the whole group. Duration presentation 15 - 20 minutes
	Allowed tools:
	All
	Internal/External censorship:
	Additional comments:

Grading criteria:	The Danish 7 – point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	In total 55 hours, corresponding to 33%
	Category 2: Initiated by the teacher with the participation of students
	In total 75 hours, corresponding to 45%
	Category 3: Initiated by students, with the participation of students
	In total 35 hours, corresponding to 21%
	Category 4: Initiated by students, with the participation of teachers
Resources:	Wheeler and Ganji: Introduction to Engineering experimentation
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	

12.1.4 c

Finite Element Methods, ME-FEM1	
Title:	Finite Element Methods
Code:	ME-FEM1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Jon Svenninggaard
ECTS-point:	4
Prerequisites:	Knowledge of the mechanics of materials and the metallurgy of steel. For full degree students, this is covered in the course ME-MME Knowledge of vector and matrix algebra is important.
Internal prerequisites:	ME-MME1, ME-ESC2
Main purpose:	To enable the student to solve linear static problems using the FE method, and be able to recognize possibilities and limitations in using a commercial FE software.
Key words:	FEM, FEA, finite element method, simulation, nodes, elements, mathematics, math
Topics:	The course will include the following topics: - Introduction to the FE method - Theory of elasticity - Bar and beam elements - Triangular and quadratic elements - Bilinear quadratic element - Direct method - Boundary conditions - Mesh convergence and quality - Singularities - Introduction to Ansys Workbench
Knowledge:	The student will gain knowledge about the FE method and its applications. He/she will gain an understanding how the method works and will be able to solve simple problems analytically and using commercial software.
Skills:	The student will be able to make design calculations on slender structures, plates and columns. Be able to assign non- destructive test methods to various types of welds. Design welded and bolted joints. Evaluate the lifetime of a component or welded joint subjected to fatigue.
Competences:	Upon taking the course, the student will be able to judge about the possibilities in using commercial FE software in linear static problems.
Teaching methods and study activities:	4 ECTS resembles a work load of 110 hours. 3 teacher assisted lessons a week for 9 weeks. Followed by 3 weeks of three lessons to be used for the mini project. The teacher assisted lessons will consist of 45 – 90 minutes of lecture followed by working with problems in the classroom with teacher assistance. There will be reading in-between lectures which must be taken into account. The three last weeks will be used on the mini project in order to solve a chosen problem and work with theory on that specific problem.
Evaluation:	
Examination:	**Examination attendance requirements:**
	All mandatory assignments must be handed in during the semester. The mini project must be presented in class.
	Type of examination:
	Oral
	Allowed tools:
	None
	Internal/External censorship:
	External
	Additional comments:
	N/A
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	Classroom teaching

	Mini project supervision Exam In total 36 hours, corresponding to 33%
	Category 2: Initiated by the teacher with the participation of students
	Problem solving Preparation for the classes Midterm evaluation Mini project work In total 44 hours, corresponding to 40%
	Category 3: Initiated by students, with the participation of students
	Self-study Preparation for the classes Literature search Mini project work In total 30 hours, corresponding to 27%
	Category 4: Initiated by students, with the participation of teachers
	N/A
Resources:	Required: Chen, Xiaolin & Liv, Yijun; Finite Element Modelling and Simulation with ANSYS Workbench; 1st edition; CRC Press; ISBN 978-1439-87384-7. Additional: Cook, Robert D. [Et al]; Concepts and applications of finite element analysis; Latest edition; Wiley; ISBN 978-0471-35605-9
Additional information:	N/A
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Mechanical Engineering: Compulsory course for mechanical Engineering; 4th semester, Feb – Jun 2017 Exchange; Mechanical engineering classic, Feb – Jun 2017

12.1.4 d

Occupational Safety & Health, Operating Technique, Quality Control, ME-OOQ1	
Title:	Occupational Safety & Health, Operating Technique, Quality Control
Code:	ME-OOQ1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Bo Leander Gylling
ECTS-point:	4
Prerequisites:	Basic knowledge within manufacturing processes
Internal prerequisites:	
Main purpose:	The student will acquire knowledge about occupational health and safety issues to be able to make machine constructions and production setups in respect to the legislations in this area. They will be provided with the competences to use quality tools to secure a good and safe production setup and be able to think quality issues into their development of products, in order to produce them in a safe and easy way.
Key words:	
Topics:	Operating technique: -Systems of productions and managing by ERP. -Factory layout, preparation and analysis -Materials Management Quality control: -ISO 9000 -Quality systems Occupational safety and health: -EU/regional legislation -Ergonomics -Work environment, mental and physical External environment: -EU/regional legislation -Greenhouse effect -Green accounting
Knowledge:	The student will gain knowledge in common legislations of occupational health and safety, where to find these and the consequences of using them. They will know common quality systems and how to use them. Furthermore, the student will gain knowledge about different possible production layouts and setups, in order to be able to select between them.
Skills:	The student will have skills in: - selecting suitable plant layout - calculating the economic batch size - analysing operational and quality technical conditions of production enterprises - analysing the company's work environment, physically and mentally - analysing products and corporate influence on the external environment - work through simple life-cycle analysis of products - operate simple processes in ERP system.
Competences:	Upon completing the course, the student will be able to: - Combine analysis results and evaluate the operability of the producing companies. - describe and apply quality management methods and quality control into product development and production setups. - analyse occupational safety and health, physically and mentally in manufacturing companies and choose solutions on found problems. - describe and explain the business impact on the surrounding community, including resource consumption: Emissions to water, soil and air, and waste disposal - Knowing the functionality of ERP systems.
Teaching methods and study activities:	4 lessons per week for 12 weeks with theoretical instructions. Course work to be delivered regularly throughout the semester. The workload for the student is likely to be 110 hours, of which minimum 1 week is used for supervision in course assignments.
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory course activities completed

	Type of examination:
	Evaluation of course activities
	Allowed tools:
	All
	Internal/External censorship:
	Internal
	Additional comments:
	Course assignments Indicative influence on grade with 100%
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	· Education, scheduled lessons · Tests In total 48 hours, corresponding to 44%
	Category 2: Initiated by the teacher with the participation of students
	· Problem solving, self-study · Group work · Preparing for classes · Evaluation of teaching In total 45 hours, corresponding to 41%
	Category 3: Initiated by students, with the participation of students
	· Own preparation for classes and exams · Self-study activities · Literature search In total 12 hours, corresponding to 11%
	Category 4: Initiated by students, with the participation of teachers
	· Debate Events · Study In total 5 hours, corresponding to 4%
Resources:	Hand out memos.
Additional information:	Supplementary literature: Manufacturing Strategy- John Miltenburg. Pupl:Taylor & Francis. ISBN-10: 1563273179 The New Lean Toolbox: Towards Fast,Flow - John Bicheno. Pupl: Picsie Books. ISBN-10: 0954124413 The Toyota Way- Jeffrey K. Liker. Pupl: McGraw-Hill. ISBN-10: 0071392319 Workplace Strategies and Facilities Management- Rick Best. Pupl: Elsevier Science & Technology. ISBN-10: 0750651504 Facilities Management Handbook -Frank Booty. Pupl: Elsevier Science & Technology. ISBN-10: 0750689773 Selecting the Right Manufacturing Improvement Tools- Ron Moore. ISBN-10: 0750679166 Logistikledelse i forsyningskæder- Poul Erik Christiansen. Pupl: Ingeniøren/bøger. ISBN: 978-87-571-2206-0
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Mechanical Engineering; Compulsory Course for Mechanical Engineering; 4th semester;

12.1.4 e

Thermodynamics, ME-TER1	
Title:	Thermodynamics
Code:	ME-TER1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Carsten Nielsen
ECTS-point:	4
Prerequisites:	Basic Engineering Mathematics and Physics
Internal prerequisites:	The student will obtain knowledge of the basic theory within thermodynamics and be able to perform elementary thermal calculations. He/she will be able to incorporate energy aspect in mechanical projects and have a basic knowledge of energy specialisation.
Main purpose:	Ideal gas, the main laws of thermodynamics, combustion, liquid flow, dimensioning of pumps, heat transfer, heat exchangers, water vapour, steam power plants.
Key words:	Ideal gas, the main laws of thermodynamics, liquid flow in pipes, dimensioning of pumps, heat transfer and heat exchangers, water vapour and steam power plants.
Topics:	Ideal gas, the main laws of thermodynamics, liquid flow in pipes, dimensioning of pumps, heat transfer and heat exchangers, water vapour and steam power plants.
Knowledge:	Describe, construct and interpret a thermodynamic system. Apply and understand the main laws and fundamental concepts of thermodynamics. Calculate and depict processes for ideal gas and water vapour. Apply elementary flow theory for calculations and dimension of pipe systems and pumps. Calculate and dimension heat exchangers/heat transmission. Calculate main data for plants that use water vapour for production of power and heat.
Skills:	Analyse a thermodynamic system and select relevant theory in order to enable the student to calculate variables and main capacities for the system. Use the thermodynamic calculation as basis of calculation of geometric dimensions for the system or selection of components. Use EES software for thermodynamic calculations
Competences:	The student will be able to identify energy aspects in mechanical projects and solve simple thermodynamic problems and/or communicate with engineers and companies about energy aspects.
Teaching methods and study activities:	Instruction in class: 4 lessons a week for 12 weeks, corresponding to 110 hours of work for the student. The course is based on student theory studies at home followed by problem based exercises in class, in groups or individually.
Evaluation:	
Examination:	**Examination attendance requirements:**
	Mandatory course activities completed and accepted Test(s)/ Lab tests completed and accepted
	Duration of examination:
	3 hours written exam
	Allowed tools:
	All
	Internal/External censorship:
	External
	Additional comments:
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	In total 35 hours, corresponding to 32%
	Category 2: Initiated by the teacher with the participation of students
	In total 50 hours, corresponding to 45%

	Category 3: Initiated by students, with the participation of students
	In total 25 hours, corresponding to 23%
	Category 4: Initiated by students, with the participation of teachers
	N/A
Resources:	Gundtoft/Bredahl/Birkkjær: Thermodynamic. Nyt Teknisk Forlag. English version. Åge Bredahl Eriksen: Flow theory. VIA UC. English version. Fluid Mechanics: Fundamentals and Applications, Cengel Thermodynamics: An Engineering Approach, Cengel Heat and Mass Transfer: Fundamentals & Applications, Cengel EES software
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	GBE 6th semester; Elective for the specialisation Sustainable Energy 2017 Feb-Jun MA Compulsory Course for Mechanical Engineering; 4th semester 2017 Feb-Jun ME Compulsory Course for Mechanical Engineering; 4th semester 2017 Feb-Jun ME Exchange Sustainable Energy 2017 Feb-Jun

12.1.4 f

ME-Study Project 4: Business-oriented Development Project	
Title:	ME-Study Project 4: Business-oriented Development Project
Code:	ME-SEP4
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Bo Leander Gylling
ECTS-point:	8
Prerequisites:	ME-SEP3
Internal prerequisites:	
Main purpose:	The project aims to develop the student's skills needed to develop, manage and implement projects in cooperation with others, incorporating both technical and economic problems. It is crucial that the student develop skills to independently acquire new knowledge in technical and scientific fields and is also able to apply this new knowledge and previously learned skills to solve a complex problem. Furthermore, the student will be aware of the methodological choices and have familiarity with the theoretical basis for this.
Key words:	
Topics:	Project Management Quality Function Deployment (House of Quality) Economic Analyses learned theory from ECE M1 Research Methods, taught theory from LAB M1. Construction and control process tailored to the current project selection Legislation (Machinery Directive, EMC Directive, data legislation, etc.) Philosophy of Science and method.
Knowledge:	The student should out fill the specific unknown knowledge in respect to the needs in the project.
Skills:	
Competences:	- Lead and manage a project in collaboration with a project team, including state records and other relevant systematic tools for monitoring projects. - Perform investment calculations and cost estimates and be able to propose and calculate the consequences of financing a project. - Develop solutions, and make a systematic choice from a completed idea creation. - Prepare the necessary documentation for the project/product complies with applicable laws/regulations such as the Machine Directive, electrical safety, etc. - Demonstrate that the selected solutions may be causing the least possible environmental impacts. - Describe each functions and control of functions, and select suitable components. - Pick overall control principles and describe functions of complete product/system. - Construct, design and document the product/system. - Select and apply relevant theories and methods to solve the complex problems of a project, using the latest national as well as international research. - Make use of previously learned working methods/approaches for project work. - Prepare a project report, which is a visible link between the technical and commercial area. - Develop a process report in which the project/process is documented, analysed and evaluated. Emphasis is placed on the reports being well-structured and formulated in a concise, precise and clear language. - Present the project orally in a well-organized and convincing manner. - Demonstrate an analytical and rational thinking, creativity, initiative, and desire to learn interpersonal skills, project characteristics, critical thinking and self-criticism. - Distinguish between science theories, methodologies, methods, techniques and instruments.
Teaching methods and study activities:	Student project on 4th semester, with the choice of academic theme. The work is expected to be 220 hours per student. The project should be carried out by groups of preferably 4 students. The project will run

	parallel with other lessons in the 12 weeks of the semester. In the last 3 weeks, there will be opportunity to work full time on the project. (That means an average workload per week of minimum 10 hours/student in the first 9 weeks). -The activities should be carried out as self-study, with the possibility to get necessary guidance from the supervisor. Report: Project report must be max. 50 pages + appendix. The process rapport, which is part of the appendix, must be max. 10 pages. At the project start, the following is used: - 2 lessons of introduction to project - 2 lessons to the House of Quality - 4 lessons of Philosophy of Science and Method
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory assignments handed in before deadline and accepted.
	Type of examination:
	Group presentation followed by an individual examination with the presence of the whole group. Duration of presentation will be 15 - 20 minutes
	Allowed tools:
	All
	Internal/External censorship:
	External
	Additional comments:
	Oral examinations indicative influence on final grade: 50%
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	· Education, scheduled lessons · Project supervision · Examination In total 18 hours, corresponding to 8%
	Category 2: Initiated by the teacher with the participation of students
	· Problem solving, self-study · Project work · Preparing for classes and exams In total 4 hours, corresponding to 2%
	Category 3: Initiated by students, with the participation of students
	· Own preparation for classes and exams · Project · Self-study activities · Study Groups · Literature search In total 190 hours, corresponding to 86%
	Category 4: Initiated by students, with the participation of teachers
	· Debate Events · Study In total 8 hours, corresponding to 4%
Resources:	
Additional information:	Olsen Poul Bitsch og Kaare Pedersen: GB: Problem-Oriented Project Work - a Workbook. Ålykke, Peter: Optimal brug af Microsoft Project 2000. Mikkelsen, Hans og Jens Ole Riis: Grundbog i projektledelse.
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Mechanical Engineering; Project; 4th semester;

12.1.5 Semester courses 5th semester 30 ECTS

12.1.5 a

Internship, ME-INP1	
Title:	Internship
Code:	ME-INP1
Ver.:	1,1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Inge Lundrup
ECTS-point:	30
Prerequisites:	All compulsory courses, projects and workshops on the first four semesters must be assessed as passed
Internal prerequisites:	
Main purpose:	The student will gain insight into how engineering tasks are carried out in practice, including: · Gain experience in how the studied theory can be applied in practice · Develop good working habits and interpersonal skills · Strengthen analytical and creative skills in solving a given task · Develop a holistic sense through direct involvement in engineering assignments · Gain knowledge into organisational structures as well as working conditions · Document own experience and data in a structured manner
Key words:	
Topics:	Supervisors will be appointed, both a company supervisor and an academic supervisor from the University College
Knowledge:	The student must gain knowledge and insight into Engineering tasks of relevance to a mechanical engineer.
Skills:	The student must acquire practical skills within the field of mechanical engineering.
Competences:	The internship will: · Promote the student to take an engineering-oriented approach during the remaining semesters on the Bachelor programme. · Motivate the student to develop intrapersonal skills required for the professional career as engineer. · Form the basis for developing personal/professional networks.
Teaching methods and study activities:	The internship is carried out on the fifth semester and consists of minimum 20 weeks of full time work. The internship itself accounts for approx. 740 hours. Documentation, exam etc., account for approx. 85 hours.
Evaluation:	Assessment is based on: • Reports - hand in during the internship and • Statements/recommendation from the company and final internship meeting with all interns, supervisor and interested students
Examination:	Examination attendance requirements:
	Type of examination:
	Allowed tools:
	Internal/External censorship:
	Additional comments:
Grading criteria:	Pass / non-pass
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	· Supervision · Examination In total about 5 hours, corresponding to 1%
	Category 2:

	Initiated by the teacher with the participation of students
	In total about 0 hours, corresponding to 0%
	Category 3: Initiated by students, with the participation of students
	· Project work · Self-study activities · Assignments · Literature search In total about 810 hours, corresponding to 97%
	Category 4: Initiated by students, with the participation of teachers
	- Meetings In total about 10 hours, corresponding to 2%
Resources:	
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Compulsory course for Mechanical Engineering; 5th semester

12.1.6 Semester courses 6th semester 30 ECTS

12.1.6 a

International Project Management, ME-SEP6	
Title:	International Project Management
Code:	ME-SEP6
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Inge Lundrup
ECTS-point:	4
Prerequisites:	Internship must be passed
Internal prerequisites:	
Main purpose:	The purpose of the project is to develop the experiences and the competences of the participants in counselling regarding a project in which the students in the project group have an international background. The participants must develop the competences to start, manage and complete international projects including technical and/or mercantile as well as linguistic/cultural issues. The focus is on the role as consultant. The participants are not completing a project in the usual manner themselves. Instead they are consultants.
Key words:	Consultant, develop own competences regarding the ability to collaborate, project managing skills, efficient communication, self-criticism, self-reflection
Topics:	• **To work as a consultant in connection with the topics described for ME-PKO1** • **To help the project group solving any group based conflicts** • **To help the group overcome other unexpected barriers**
Knowledge:	
Skills:	
Competences:	• **To develop competences in terms of analytical and rational thinking, creativity, initiative, desire to learn, collaboration skills, project management skills, critical sense, self-criticism, self-reflection.** • **To live up to the partial goals described for ME-PKO1.**
Teaching methods and study activities:	The project is expected to be 110 hours work for each student
Evaluation:	
Examination:	Examination attendance requirements:
	Type of examination:
	Oral exam. Examination is based partly on the report and partly on questions asked about personal communication and competences in relation to the issues mentioned in the report. The examination is a dialogue about the important role as consultant and an assessment of the practical managing work performed by the student – as described under items Competences and Topics.
	Allowed tools:
	None
	Internal/External censorship:
	Internal
	Additional comments:
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• **Project counselling** • **Exam** In total 54 hours, corresponding to 25%
	Category 2: Initiated by the teacher with the participation of students
	Project work and group work

	Preparation for I
	Category 3: Initiated by students, with the participation of students
	• Self-preparation for lessons and exams • Project work • Self-study activities • Study groups • Searching for literature In total 111 hours, corresponding to 50%
	Category 4: Initiated by students, with the participation of teachers
	In total 0 hours, corresponding to 0%
Resources:	
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	

12.2 Elective courses

12.2.1 Semester course spring 30 ECTS

12.2.1 a

Advanced Engineering Mathematics, ME-AEM1	
Title:	Advanced Engineering Mathematics
Code:	ME-AEM1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Uffe Vestergaard Poulsen
ECTS-point:	6
Prerequisites:	
Internal prerequisites:	ME-ESC1/MA-ESC1; ME-MAT2
Main purpose:	The purpose of this course is to give the student a mathematical foundation for studying mechanical engineering beyond the Bachelor level. The main focus is on a comprehensive introduction to ordinary and partial differential equations and methods for their solution.
Key words:	Ordinary differential equations, vector calculus, partial differential equations
Topics:	1) Ordinary differential equations (ODEs) a) First order ODEs: basic concepts, directional fields, linear ODEs, separable ODEs, exact ODEs b) Second order ODEs: homogeneous linear case, homogeneous linear case w. constant coefficients (all cases), existence and uniqueness of solutions, nonhomogeneous case, the forced oscillator c) Higher order ODEs: homogeneous linear case, homogeneous linear and linear w. constant coefficients, nonhomogeneous linear case, the elastic beam d) Systems of ODEs: basic concepts, phase plane methods, linearization, nonhomogeneous case 2) Vector calculus a) Vector analysis: basic concepts, gradient, divergence, curl b) Vector integral calculus: line, surface, and volume integrals, Stokes theorem, Gauss divergence theorem 3) Partial differential equations (PDEs) a) Fourier analysis: Fourier series, Fourier integrals, expansion of even/odd functions, Sturm-Liouville problems b) Basic concepts: important types, principle of superposition, boundary conditions c) Derivation of PDEs: wave equation (1D and 2D), heat equation d) Solution method: separation of variables, use of Fourier series
Knowledge:	Upon completing this course the student must know: - How differential equations are used in the modelling of physical phenomena. - The key concepts in the theory of ordinary differential equations (ODEs) and their solution. - The key concepts in vector calculus including the most important transformation theorems of vector integral calculus. - The key concepts in the theory of partial differential equations (PDEs). - The key concepts in the theory of Fourier analysis and in particular how it can be applied in the solution of partial differential equations.
Skills:	Upon completing this course, the student must be able to: - Recognize and solve different types of ODEs - Apply the most important differential operators - Evaluate multi-dimensional integrals of vector functions also using integral transformation theorems - Calculate Fourier series and integrals - Recognize different types of PDEs and boundary conditions - Solve PDEs using Fourier analysis

Competences:	Upon completing this course, the student must be able to: - Recognize physical phenomena and engineering problems where ODEs and/or PDEs are needed for mathematical modelling. - Perform such mathematical modelling in simple cases and solve the resulting equations. - Use sources of information that apply to the language of ODEs, vector analysis, and PDEs in either a job situation or in the context of further studies.
Teaching methods and study activities:	5 lessons per week for 12 weeks. For the student a total workload of 165 hours is to be expected.
Evaluation:	
Examination:	Examination attendance requirements:
	None
	Type of examination:
	4 hours
	Allowed tools:
	All
	Internal/External censorship:
	Internal
	Additional comments:
	None
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Classroom teaching • Examination A total of about 50 hours, corresponding to 30%
	Category 2: Initiated by the teacher with the participation of students
	• Preparation for class • Homework • Midterm evaluation A total of about 75 hours, corresponding to 45%
	Category 3: Initiated by students, with the participation of students
	• Self-study • Exam preparation A total of about 40 hours, corresponding to 24%
	Category 4: Initiated by students, with the participation of teachers
	A total of 0 hours, corresponding to 0%
Resources:	Required: • Erwin Kreyszig, Advanced Engineering Mathematics (Wiley) – latest edition
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	6th semester; Elective for the specialization Innovation and Product Design; Elective for the specialization Intelligent Mechanics; Elective for the specialization Sustainable Energy

12.2.1 b

Design of Energy Systems, ME-DES1	
Title:	Design of Energy Systems
Code:	ME-DES1
Ver.:	1.0
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Carsten Nielsen
ECTS-point:	4
Prerequisites:	Elementary energy/ thermodynamics course
Internal prerequisites:	
Main purpose:	The student will obtain knowledge in and calculation practice of refrigeration and heat pump systems in order to be able to design an efficient, environmentally friendly energy plant.
Key words:	Cooling plants, heat pumps, air handling plants, air conditioning, energy efficiency, environment
Topics:	Refrigeration plants and heat pumps, energy efficiency and impact on the environment
Knowledge:	The student will obtain knowledge of the refrigeration cycle, air conditioning theory, natural refrigerants, basic refrigeration and heat pump designs and applications. Furthermore, the student will be able to calculate the dimensioning load on the plant, select the most common control and safety equipment and analyse the environmental aspect of plant design.
Skills:	The student will be able to analyse the thermal load for an energy plant and on this basis combine process theory and common dimensioning practice to design an energy efficient cooling plant or heat pump with low environmental impact.
Competences:	The student will obtain competences to communicate about designs of different types of energy plants. Furthermore, the student will be able to design simple energy plants in a methodical way and more complex systems in co-operation with energy engineers.
Teaching methods and study activities:	120 hours during a period of 12 weeks. Theory, assignments and compulsory written tasks. Practical exercises and company visits.
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory assignments handed in before deadline and accepted
	Type of examination:
	Individual oral examination without preparation based upon course assignment(s)
	Allowed tools:
	None
	Internal/External censorship:
	External
	Additional comments:
	Course assignments Indicative influence on grade: 50%
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	In total 25 hours, corresponding to 23%
	Category 2: Initiated by the teacher with the participation of students
	In total 45 hours, corresponding to 41%
	Category 3: Initiated by students, with the participation of students
	In total 40 hours, corresponding to 36%
	Category 4: Initiated by students, with the participation of teachers
	N/A
Resources:	Refrigeration and Air-Conditioning, Hundy/Trott/Welch, Elsevier, 2008. CoolPacksoftware, www.ipu.dk Collection of exercises - studynet Compendium - studynet: Design of energy systems/Humid air
Additional information:	
Valid from:	01-08-2016

Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	GBE 8th semester; Elective for the specialization Sustainable Energy 2016 Aug-Jan; 2017 Feb-Jun MA 6th semester; 7. semester; Compulsory for the specialization Sustainable Energy 2016 Aug-Jan; 2017 Feb-Jun ME 6th semester; 7. semester; Compulsory for the specialization Sustainable Energy 2016 Aug-Jan; 2017 Feb-Jun ME Exchange Sustainable Energy 2016 Aug-Jan; 2017 Feb-Jun

12.2.1 c

Renewable Energy, ME-ENE1	
Title:	Renewable Energy
Code:	ME-ENE1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Carsten Nielsen
ECTS-point:	4
Prerequisites:	Basic knowledge of thermodynamics
Internal prerequisites:	
Main purpose:	The purpose of the course is to ensure that the student will understand the design and calculation of renewable energy plants with focus on energy production, energy savings and environmental conditions.
Key words:	Energy savings, wind energy, heat pumps, thermal solar heating, biogas, biomass, district heating.
Topics:	Energy savings, Use of wind energy in energy systems, Solar basics and thermal solar heating systems Combustion of biomass Biogas, District heating and district heating network, Heat pump applications, Renewable energy management (e.g. tax structures, costs for energy production, cost analyses, environmental issues)
Knowledge:	The student will obtain knowledge of the design of plants for renewable energy. Be able to calculate energy production and capacities of renewable energy plants. Calculate and plan energy savings. Calculate environmental improvements for renewable energy plants.
Skills:	Analyse the consumption for a town or a building and evaluate possible energy savings. Select technology and calculate the energy production from renewable sources. Calculate the eventually needs for supplementary fossil fuel production and the saving of CO2 emission.
Competences:	The student will be able to communicate with students, engineers and companies about renewable energy and outline proposals for renewable energy supply.
Teaching methods and study activities:	One semester of 12 weeks. Acquired workload for the student is estimated to 120 hours. Activities include; theory, problem solving, assignments and mini project.
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory assignments handed in before deadline and accepted.
	Type of examination:
	Individual oral examination without preparation based upon course assignment(s)
	Allowed tools:
	None
	Internal/External censorship:
	External
	Additional comments:
	Course assignments Indicative influence on grade: 50%
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	In total 25 hours, corresponding to 23%
	Category 2: Initiated by the teacher with the participation of students
	I total 45 hours, corresponding to 41%
	Category 3: Initiated by students, with the participation of students
	In total 40 hours, corresponding to 36%
	Category 4: Initiated by students, with the participation of teachers
	N/A
Resources:	Eriksen, Åge Bredahl: Compendium: Renewable energy
Additional information:	

Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	BY Elective for the specialisation Energy Design 2016 Aug-Jan; 2017 Aug-Jan CE Elective for the specialisation Energy Design 2016 Aug-Jan; 2017 Aug-Jan CE Exchange Energy Design 2016 Aug-Jan GBE 8th semester; Elective for the specialisation Sustainable Energy 2016 Aug-Jan MA 6th semester; 7th semester; Compulsory for the specialisation Sustainable Energy 2016 Aug-Jan ME 6th semester; 7th semester; Compulsory for the specialisation Sustainable Energy 2016 Aug-Jan ME Exchange Sustainable Energy

12.2.1 d

Fracture Mechanics and Fatigue, ME-FRM1	
Title:	Fracture Mechanics and Fatigue
Code:	ME-FRM1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Jon Svenninggaard
ECTS-point:	4
Prerequisites:	Knowledge of mechanics of materials and the metallurgy of steel.
Internal prerequisites:	ME-MME1
Main purpose:	Course main purpose: To give the student a basic knowledge about fracture mechanics and fatigue in metallic structures as well as its theory and applications.
Key words:	Fracture mechanics, stress intensity factor, energy release rate, crack growth, da/dN method. Paris Equation.
Topics:	The course will cover the following subjects: - Linear elastic fracture mechanics - Stress intensity factor - Critical stress intensity factor - Crack tip opening displacement - Monotonic and cyclic stress strain curves - Energy release rate - High cycle and low cycle fatigue - Effects of mean stress effects and the Haigh diagram - Fatigue crack growth da/dN - Paris Law - Palmgren Miner damage rule - Hot spot method - Cycle counting
Knowledge:	Gain knowledge about the crack opening mechanisms in metallic materials. Gain knowledge about how the mechanism of crack propagation occurs as well as how fracture mechanics and fatigue are related.
Skills:	After the course the student will be able to apply fracture mechanics methods to real life cracked parts in order to define the expected lifetime for the given specimen. The student will be able to calculate expected lifetime for new parts as well as being able to assess designs and evaluate them with respect to fatigue and fracture mechanics.
Competences:	The student will be able to evaluate already cracked specimens and define the expected remaining lifetime for the given part. Furthermore, the student can act as part of a surveyor team that investigates broken machinery due to dynamic loading and describe the circumstances that lead to the failure. Upon completing the course, the student will be able to use the knowledge and acquired skills in projects involving dynamical moving parts to calculate dimensions and specify designs.
Teaching methods and study activities:	4 ECTS resembles a work load of 110 hours. 3 teacher assisted lessons a week for 12 weeks. The teacher assisted lessons will consist of 45 – 90 minutes of lectures followed by working with problems in the classroom with teacher assistance. There will be reading in-between lectures which must be taken into account. Furthermore, there will be assignments which must be handed in, in order to qualify for examination.
Evaluation:	
Examination:	**Examination attendance requirements:**
	The examination is conducted as an oral examination. The duration will approximately be 20 minutes per student. The questions for the examination are disclosed during the semester. One of these questions is picked in a lottery at the examination.
	Type of examination:
	Oral
	Allowed tools:
	None
	Internal/External censorship:
	External
	Additional comments:

	N/A
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Classroom teaching • Assignments supervision • Exam In total 36 hours, corresponding to 33%
	Category 2: Initiated by the teacher with the participation of students
	• Problem solving • Preparation for the classes • Midterm evaluation • Assignments • Preparation for the exam In total 44 hours, corresponding to 40%
	Category 3: Initiated by students, with the participation of students
	• Self-study • Preparation for the classes • Literature search In total 30 hours, corresponding to 27%
	Category 4: Initiated by students, with the participation of teachers
	N/A
Resources:	Required: Fuchs, H.O. and R.I. Stephens, "Metal Fatigue in Engineering", John Wiley & Sons,1980. Latest edition
Additional information:	N/A
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Mechanical Engineering; 6th semester; Elective for the specialization Innovation and Product Design;

12.2.1 e

Logic and Sequence Control, ME-LSC1	
Title:	Logic and Sequence Control
Code:	ME-LSC1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Per Ulrik Hansen
ECTS-point:	4
Prerequisites:	basic knowledge of mathematics, physics and electrical circuits.
Internal prerequisites:	
Main purpose:	The student must be able to design a complete on-off control for a machine, using typical a PLC as controller.
Key words:	Boolean logic, sequential logic, sequence control, sensors, actuators, relay control, PLC control, safety
Topics:	• Control problems in the industry and typical on-off controlled machines • Sensors, controllers, actuators, human interface • Boolean functions, latch and unlatch, blocking and releasing • Relay control of motors and valve control • Timers and Counters • Sequence control (state control) and branches, parallel processes, repetitions etc. • Specification of sequence control systems using flow charts diagrams, Grafcet diagrams or similar. • Safety circuits (motor protection, emergency stops etc.) • PLC hardware • PLC programming
Knowledge:	The student can explain Boolean logic, sequential logic, sequence control, sensors, actuators, relay control, PLC control, safety.
Skills:	The student understands hardware in on-off control systems and can specify the operation of the system. Further, the student can develop the complete control for a system with a single controller, including system operation and safety
Competences:	The student can design a complete on-off control for a machine, using typical a PLC as controller.
Teaching methods and study activities:	Class lessons, lectures, problem solving, laboratory work and mandatory assignments.
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory course activities completed
	Type of examination:
	Individual oral examination without preparation based upon course assignments
	Allowed tools:
	Internal/External censorship:
	Additional comments:
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	Hours 25 – 23%
	Category 2: Initiated by the teacher with the participation of students
	Hours 35 – 32%
	Category 3: Initiated by students, with the participation of students
	Hours 50 – 45%
	Category 4: Initiated by students, with the participation of teachers

Resources:	Bolton, W., Programmable Logic Controllers, 5. ed. (2009), Newnes, ISBN: 978-1-85617-751-1.
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	

12.2.1 f

Mechanical Vibrations, ME-MEV1	
Title:	Mechanical Vibrations
Code:	ME-MEV1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Morten Carter
ECTS-point:	4
Prerequisites:	This course requires basic knowledge of planar kinematics and kinetics of rigid bodies and basic knowledge of fundamental calculus, linear algebra especially ordinary differential equations, eigenvalues and eigenvectors corresponding.
Internal prerequisites:	ME-DYN2, ME-MAT2
Main purpose:	The purpose of the course is to enable the student of using mathematical methods for solving mechanical vibration problems. The student must understand the basic properties of mechanical vibrations and learn the methods for analysis of mechanical vibrations. The student must be able to carry out calculations on simple vibrations problems.
Key words:	Free vibrations, response to harmonic excitation, multiple degrees-of-freedom, Fourier series.
Topics:	• Free vibrations for systems with one degree of freedom (1DOF), • Free vibrations with viscous damping • Response to harmonic excitation • Multiple-degree-of-freedom systems • Fourier series • Response to general periodic excitation (1DOF) • The Fast Fourier transform (FFT)
Knowledge:	• The basic theory of modelling vibrating systems • The basic theory of Fourier series for any periodic function • The concept of resonance in vibrating system
Skills:	• Set up equation of motion for one-degree systems • Understand how to find the natural frequency • Analyse 1DOF systems with viscous damping • Analyse 1DOF systems due to a harmonic load • Set up equation of motion for two-degree model systems (2DOF) • Understand how to find eigenvalues and natural frequencies • Analyse 1DOF systems due to a general periodic load
Competences:	The student must be able to apply the obtained skills on model systems and use the covered concepts in the analysis of simple real systems.
Teaching methods and study activities:	Workload for the student is about 110 hours. Activities changes between theory, self-study, and solving problems. 1 semester (12 weeks) including 3 lessons a week.
Evaluation:	
Examination:	Examination attendance requirements:
	None
	Type of examination:
	4 hours
	Allowed tools:
	All
	Internal/External censorship:
	Internal
	Additional comments:
	None
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Classroom teaching • Examination

	A total of about 30 hours corresponding to 27%
	Category 2: Initiated by the teacher with the participation of students
	• Preparation for class • Assignments • Midterm evaluation A total of about 50 hours corresponding to 45%
	Category 3: Initiated by students, with the participation of students
	• Mini project work • Self-study A total of about 30 hours corresponding to 27%
	Category 4: Initiated by students, with the participation of teachers
	A total of 0 hours corresponding to 0%
Resources:	Required: • Inman, Daniel J.: Engineering Vibration, Person – Prentice Hall. Latest edition. Recommended: • Hibbeler, R.C., Dynamics, SI-units edition, Prentice Hall.
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	6th semester; Elective for the specialisation Intelligent Mechanics; Mechanical Engineering Classic

12.2.1 g

Polymer Materials and Processing. ME-PMP1	
Title:	Polymer Materials and Processing
Code:	ME-PMP1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Liliana Persson
ECTS-point:	4
Prerequisites:	Basic knowledge of materials
Internal prerequisites:	
Main purpose:	To know the basic characteristics of polymers and relate and use these characteristics to the design of parts and assemblies. To know the relevant polymer processing with emphasis on injection moulding.
Key words:	Design in polymer materials, mechanical properties, structural design, extrusion, tooling and injection moulding.
Topics:	· Polymerization and building polymer materials. · Properties of polymer materials and their influence on design and manufacturing. · Part design and assembling components. · Processing of polymers. · Tool design · Foams · Rubbers · Composites
Knowledge:	The student will gain knowledge about thermoplastics, thermosets and rubbers, and relevant technological processes applying to these materials.
Skills:	Upon completing the course, the student is expected to possess the required skills to: · select polymers according to their physical and chemical characteristics · design and engineer components of polymer materials designs considering time, load and temperature · identify and describe a suitable manufacturing method for polymeric materials · design polymer parts considering tooling and injection moulding · estimate the cost price of injection moulded products
Competences:	Upon completing, the course, the student is expected - within the framework of the course - to participate in development tasks covering the design and/or evaluation and improvement of polymeric components. Furthermore, the student should be capable of seeking, validating, and implementing additional knowledge within the subject on her/his own.
Teaching methods and study activities:	Three lessons per week for 12 weeks. The workload for a student is expected to be approx. 110 hours. A mandatory course assignment will be handed in before the end of the semester.
Evaluation:	
Examination:	Examination attendance requirements:
	Course assignment handed in before deadline
	Type of examination:
	Group presentation followed by an individual examination with the presence of the whole group
	Allowed tools:
	All
	Internal/External censorship:
	Internal
	Additional comments:
	The examination is based on the course assignment and the course curriculum.
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Teaching of scheduled lessons – 27 hours (3 lessons/week x 0.75h/lesson x 12 weeks)

	• Excursion • Project counselling • Laboratory work • Exams, tests In total about 33.3 hours, corresponding to 30.3 %
	Category 2: Initiated by the teacher with the participation of students
	• Solving assignments, self-study – 10 hours • Project work and group work • Preparation for lessons and exams • Evaluation of lessons – 0.7 hours In total about 10.7 hours, corresponding to 9.7 %
	Category 3: Initiated by students, with the participation of students
	• Individual preparation for lessons and exams – 30 hours • Project work – 30 hours • Self-study activities • Study groups • Searching for literature – 3 hours In total about 63 hours, corresponding to 57.3 %
	Category 4: Initiated by students, with the participation of teachers
	• Debates • Study counselling - 3 hours In total about 3 hours, corresponding to 2.7 %
Resources:	Internet based materials/literature
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	6th semester; Elective for the specialization Innovation and Product Design

12.2.1 h

Product Analysis and Re-design, ME-PRD1	
Title:	Product analysis and Re-design
Code:	ME-PRD1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Martin Møhl
ECTS-point:	4
Prerequisites:	Basic knowledge of materials science, design and ergonomics.
Internal prerequisites:	
Main purpose:	Enabling the student to analyse a mechanical product in terms of performance, cost, manufacturing processes and environmental impact with the purpose of defining improvement possibilities within these areas.
Key words:	Re- design process, creative methods, function analyses, technology, economy, Lifecycle Analyse (LCA), prototypes and test models
Topics:	The student must be able to re-design a specific object/product by making a synthesis of alternative solutions, establishing a basis for evaluating alternative solutions, focusing on functionality, manufacturing, all based on the socio- technological relation for the product. The student must be able to make a Lifecycle Analyse (LCA) of the re-designed solution. It is important that the students gain knowledge of the possibilities within the use of computer-aided methods and building prototypes and test models.
Knowledge:	The student will gain knowledge within the following areas: Determining the requirements of end users, influencers and decision makers. Function mean tree. Life cycle analysis. Cost analysis. Defining improvement possibilities. Product portfolio management. Computer based tools for the above.
Skills:	Upon completing the course, the student is expected to possess the required skills to: Stating goals. Divide a mechanical product into their primary and secondary functions. Conduct a cost/investment analysis of the product. Re-design a product by stating and evaluating alternative solutions. Using prototypes as method for validation. Conduct a Lifecycle Analysis (LCA).
Competences:	After course completion, the student must be able to: Participate in redesign projects. Understanding needs. Choosing the relevant Engineering tools relevant for the specific project. Describing and communicating these matters internally in a group context and externally toward interested parties including decision makers.
Teaching methods and study activities:	3 lessons per week for 12 weeks. For the student, a total workload of 120 hours must be expected. The course will be based on a specific product with a well-known user group and a clear production technology or a machine/production equipment. The course will be organised as project work with analyse and idea phase carried out in groups.
Evaluation:	Course assignment handed in.
Examination:	Examination attendance requirements:
	Mandatory assignments handed in before deadline and accepted assignment handed in before deadline
	Type of examination:
	Group presentation followed by an individual examination with the

	presence of the whole group
	Allowed tools:
	All
	Internal/External censorship:
	Additional comments:
	Course assignments count 30% and the oral examinations count 70% on the final grade
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Teaching of scheduled lessons • Excursions • Project counselling • Laboratory work • Exams, tests Hours 30 %
	Category 2: Initiated by the teacher with the participation of students
	• Solving assignments, self-study • Project work and group work • Preparation for lessons and exams • Evaluation of lessons Hours 40 %
	Category 3: Initiated by students, with the participation of students
	• Individual preparation for lessons and exams • Project work • Self-study activities • Study groups • Searching for literature Hours 20 %
	Category 4: Initiated by students, with the participation of teachers
	• Debates • Study counselling Hours 10 %
Resources:	Serope Kalpakjian & Steven R. Schmid, "Manufacturing Processes for Engineering Materials", 5 edition, Prentice-Hall, 2006 Nigel Cross "Engineering Design Methods – Strategies for Product Design" third edition - John Wiley & Sons Ltd, Chichester, England , 2000. Poul M. Collier: Accounting for Managers" John Wiley & Sons Ltd, Chichester, England
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	

12.2.1 i

Product Use and Design ME-PUD1	
Title:	Product Use and Design
Code:	ME-PUD1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Yoke-Chin Lai (Ph.D.)
ECTS-point:	4
Prerequisites:	The fundamentals of product design
Internal prerequisites:	
Main purpose:	The course is to provide undergraduates with the basic knowledge of applying the human factors aspects into the product design process.
Key words:	Human factors, man-machine interaction, ergonomics, affective design.
Topics:	1. Introduction to human factors 2. Affective design 3. Human capabilities and limitations 4. Human-machine interaction 5. Human error and safety
Knowledge:	Upon the completion of the course, the student is expected to gain some understandings within the following areas: 1. The correlation of human capabilities and limitations 2. Human-centred design process 3. How affective design influences the success of a product.
Skills:	Throughout the course, the student will get familiarised with many user-centred design methods/tools, including: 1. Apply the user-centred design method. 2. Apply augmented reality technology in the conceptual design process. 3. Apply paper-prototyping technique for fast UCI prototype testing purposes. 4. Apply role-play method. 5. Verbal-protocol analysis 6. Etc.
Competences:	Upon the completion of the course, the student will be able to: 1. Characterize the user-centred design thinking. 2. Explain the basic human perception and cognitive systems and discuss how that affects product design. 3. Apply human factors principles to design problem. 4. Evaluate and justify human factors related materials on the internet as to credibility and accuracy. 5. Integrate human factors research to design problems. 6. Complete a design project in team by going through the user-centred design processes.
Teaching methods and study activities:	1. Course project: complete one design project in team. 2. Assignment: The assignment is required to be completed individually and/or in team. A few assignments are to be organized with respect to the user-centred design process. 3. Student seminar: Each student is required to present the outcomes of the assignments. The input gathered from the seminar will be used in the subsequent assignment. 4. Lectures. 5. Reading: read the assigned reading materials before coming to the class. 6. Group discussion: A frequent activity for completing the small exercises assigned during the lectures. 7. Peer reviewing: Being able to assess the peer's performance with reference to a set of given criteria is an essential skill needed in a professional career. Each student needs to actively giving feedback to the peer's works presented in student seminars. 8. Self-assessment: Being able to assess your own performance in comparison to a given criterion will help you reflect. Reflection is a crucial activity for effective learning. Assessment criteria will be provided to help you successfully complete this exercise.
Evaluation:	
Examination:	**Examination attendance requirements:**
	Course Project submitted by deadline.

	Type of examination:
	Group presentation followed by an individual examination with the presence of the whole group Duration of presentation: 15 - 20 minutes
	Allowed tools:
	All
	Internal/External censorship:
	External
	Additional comments:
	None
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Teaching of scheduled lessons • Discussion on assignment/case study solution • Project counselling • Laboratory work • Exams In total 33 hours, corresponding to 30%
	Category 2: Initiated by the teacher with the participation of students
	• Solving assignments, self-study • Project work and group work • Preparation for lessons and exams • Evaluation of lessons In total 27.5 hours, corresponding to 25%
	Category 3: Initiated by students, with the participation of students
	• Individual preparation for lessons and exams • Project work • Self-study activities • Study groups • Searching for literature In total 44 hours, corresponding to 40%
	Category 4: Initiated by students, with the participation of teachers • Debates • Study counselling In total 5.5 hours, corresponding to 5%
Resources:	Wickens, C.D., Lee, J., Liu, Y., Becker, S.G. (2004), An Introduction to Human Factors Engineering, 2nd Edition, Pearson Education Inc.
Additional information:	1. Norman, D.A. (1999), The design of everyday things, MIT Press. 2. Bridger, R.S. (2003), Introduction to Ergonomics, 2nd Ed., Taylor & Francis. 3. Nemeth, C.P. (2004), Human Factors Methods for Design Making Systems Human-Centred, CRC Press.
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	ME: 6. semester; Compulsory for the specialization Innovation and Product Design; 2017 Feb-Jun MA: 6. semester; Compulsory for the specialization Innovation and Product Design; 2017 Feb–Jun GBE: 6. semester; Elective for the specialization Innovation and Product Design; 2017 Feb-Jun

	ME Exchange: Innovation and Product Design; 2017 Feb-Jun

12.2.1 j

Robotics and Multi Body Systems, ME-RMS1	
Title:	Robotics and Multi Body Systems
Code:	ME-RMS1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Per Ulrik Hansen
ECTS-point:	4
Prerequisites:	Calculus, dynamics, kinematics, statics, DC and AC circuit analysis.
Internal prerequisites:	
Main purpose:	Analysis of commercial robots and design and analysis of "home-made" robots and mechanisms.
Key words:	Robot, mechanism, multi body system, manipulator, kinematics, kinetics, dynamics, simulation, MatLab, MathCAD.
Topics:	Robots: • Spatial descriptions of robots, mechanisms and manipulators • Coordinate transformation and transform arithmetic • Forward manipulator kinematics (position, velocity and accelerations) and inverse manipulator kinematics • Manipulator kinetics (forces and torques) • Planning robotic motion • Calculation of motion, forces, torques for robots with MathCAD and simulation with MatLab. Multi Body: • Mechanism definition and structure. • Frames, body orientation, generalized coordinates, geometric constraints and driving constraints. • Kinematical analysis (position, velocity and acceleration). • Kinetic analysis, Mass and inertia, applied forces • Forward and inverse dynamics • Multi Body programs (for example in MatLab)
Knowledge:	The student can explain the structure of robots, mechanisms, multi body systems and manipulators. Also, the student can express kinematics, kinetics, and dynamics for Robot systems
Skills:	The student can design a manipulator (for example a special designed robot for industry and laboratories) and analyse the dynamics (positions, velocities, accelerations, forces and torques in time domain) The student can analyse a closed mechanism (multi body system) with respect to motion, forces and torques. Also the student can apply multi body system analysis software.
Competences:	The student can analyse a commercial robot and design and construct a "home-made" robot or mechanism on sketch level.
Teaching methods and study activities:	36 class lessons, lectures, problem solving Major course Work
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory course activities completed
	Type of examination:
	Individual oral examination without preparation based upon course assignment(s)
	Allowed tools:
	Internal/External censorship:
	Additional comments:
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	Hours 35 – 32%
	Category 2:

	Initiated by the teacher with the participation of students
	Hours 30 – 27%
	Category 3: Initiated by students, with the participation of students
	Hours 45 – 41%
	Category 4: Initiated by students, with the participation of teachers
Resources:	Craig: Introduction to Robotics, Mechanics and Control
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	

12.2.1 k

Reverse Engineering CAD, ME-RVE1	
Title:	Reverse Engineering CAD
Code:	ME-RVE1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Kim Rask Petersen
ECTS-point:	4
Prerequisites:	Basic knowledge of 3D CAD system "Inventor" or another similar CAD system (Solid works, Solid Edge, PRO etc.)
Internal prerequisites:	
Main purpose:	To introduce some of the important tools in "Reverse Engineering", which are: -Model scanning (white light scanner GOM) -Dedicated software (Poly works) for handling and manipulating polygon models. -Integration forth and back between scanned/polygon model and CAD
Key words:	Reverse engineering, model scanning (laser scanning), software for handling point-clouds and scanned geometry.
Topics:	• Scanning models into STL data with GOM Blue Light scanner in the Innovation Lab • Working with polygon data (STL models) o Closing holes in the polygon model o Smooth and patch the polygon model o Change the density and distribution of polygons o Create sharp edges and other curves from the polygon data o Create and understand the NURBS (surfaces) generation o Import NURBS data into CAD, manipulate and re- export back to Poly works o Visits at, or visit from, external companies, using reverse engineering commercially • Course assignment using all the topics.
Knowledge:	The student will gain knowledge about the working methods used for polygon models and more specific with the software Poly works. Furthermore, the student will learn, practice and exercise the interface between polygon models and CAD systems, as this is a normal practice when modelling and engineering "organic" models.
Skills:	Scan organic models and convert scanclouds into polygon models and further on to CAD models with NURBs
Competences:	The student will understand the tools used inside model scanning and reverse engineering and get experience in using Poly works. From the software Poly works, the scanned data are converted into NURB's and imported into any CAD system. The student will get the competence to manage and understand this process from organic model to engineering data in CAD
Teaching methods and study activities:	12 weeks and 2 x 2 lesson a week, of which 2 x 45 minutes are lesson based and another 2 x 45 minutes are dedicated to exercises and training. Participating in the weekly 2 x 45 minutes training session is mandatory (80% presence). The expected work load is a minimum of 120 hours. It must be emphasized, that without a proper amount of hours spent on exercises, the course is very difficult to pass. The lessons are composed in such a way, that half of the lessons are theory, the rest is practical exercises with the software Poly works and CAD software. Some lessons are spent with practical work in the design lab with the Blue Light scanner, and the students have supervised access to the scanner. REMARKS: The number of participants is limited to 28 due to the number of seats and licenses in the M-Design Laboratory (VBI 3.03).
Evaluation:	
Examination:	**Examination attendance requirements:**
	Mandatory course activities completed and accepted

	Type of examination:
	Allowed tools:
	All
	Internal/External censorship:
	Additional comments:
	None
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students · Classroom teaching · Project supervision In total 48 hours, corresponding to 44 %
	Category 2: Initiated by the teacher with the participation of students · Problem solving · Preparation for the classes · Midterm evaluation In total 22 hours, corresponding to 20 %
	Category 3: Initiated by students, with the participation of students **Category 3** · Course Project · Preparation for the tests · Literature search In total 40 hours, corresponding to 36 %
	Category 4: Initiated by students, with the participation of teachers: N/A
Resources:	Literature and manuals will be handed out as PDF files.
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	

12.2.1 I

System dynamics, Modelling and Simulation, ME-SMS1	
Title:	System dynamics, Modelling and Simulation
Code:	ME-SMS1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Per Ulrik Hansen
ECTS-point:	4
Prerequisites:	Passed basic engineering courses in thermodynamic, electro technique, physics and mathematics.
Internal prerequisites:	
Main purpose:	The student can develop and analyse dynamic Mechatronic models, which are basic for automatic control engineering.
Key words:	Model, mathematical model, mechanical system, electromechanical system, hydraulics, pneumatics, thermal system, transients, Laplace transformation, frequency response, MatLab, simulink, simulation.
Topics:	• Formulation of system equations for technical systems (mechanical, electromechanical, hydraulic, pneumatic and thermal systems) • Solution of linear differential equations, using Laplace transformations • Application of transform concepts to engineering systems (transients and frequency response) • Numeric methods for simulation (using for example using MatLab) • Simulation of engineering systems using Simulink. • Planning and interpretation of simulation
Knowledge:	The student can explain mathematical models, mechanical systems, electromechanical systems, hydraulics, pneumatics, thermal system, transients, Laplace transformations, frequency response, and simulation using MatLab and simulink.
Skills:	The student can formulate models of technical (mechanical, electromechanical, hydraulic, pneumatic or thermal) systems and analyse the static and dynamic behaviour. Analyses are based on time domain behaviour, frequency domain behaviour and simulation using MatLab and Simulink.
Competences:	The student can develop and analyse dynamic Mechatronic models.
Teaching methods and study activities:	36 class lessons, lectures, problem solving. Major course work.
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory course activities completed
	Type of examination:
	Individual oral examination based upon a subject found by draw. No preparation
	Allowed tools:
	Internal/External censorship:
	Additional comments:
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	Hours 30 – 27%
	Category 2: Initiated by the teacher with the participation of students
	Hours 30 – 27%
	Category 3: Initiated by students, with the participation of students
	Hours 50 – 45%
	Category 4: Initiated by students, with the participation of teachers

Resources:	Ogats: System Dynamics
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	

12.2.1 m

Sustainable Power Production, ME-SPP1	
Title:	Sustainable Power Production
Code:	ME-SPP1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Carsten Nielsen
ECTS-point:	4
Prerequisites:	Thermodynamics (or simultaneous with ME-TER1)
Internal prerequisites:	
Main purpose:	The main purpose is to gain basic knowledge and design of sustainable power production with wind turbines, photo voltage installations and fuel cells.
Key words:	PV cells, fuel cells, wind turbine design, annual power production, power curve, generator systems, smart grid.
Topics:	PV cells, fuel cells, wind turbine design, annual power production, power curve, generator systems, smart grid.
Knowledge:	Understand the function of a wind turbine. Be able to calculate annual power production of a wind turbine or wind farm by means of WAsP computer programme. Understand how mechanical energy is converted into electricity, how electricity is distributed and transported in smart grid. Understand the mode of operation of PV cells. Calculate and design a photo voltage installation. Understand the functions of fuel cells.
Skills:	Use the WAsP computer programme to estimate annual power production for a wind turbine or a group of wind turbines. Calculate and design a photo voltage installation with a specific capacity. Be able to communicate with electric grid specialists.
Competences:	The student will be able to carry out study project in the area of sustainable power production and to participate in projects in corporation with experienced engineers.
Teaching methods and study activities:	One semester of 12 weeks. Acquired workload for students is estimated to 120 hours. Activities include; theory, problem solving, compulsory written tasks.
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory assignments handed in before deadline and accepted.
	Type of examination:
	Individual oral examination without preparation based upon course assignment(s)
	Allowed tools:
	None
	Internal/External censorship:
	External
	Additional comments:
	Course assignments Indicative influence on grade: 50%
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	In total 25 hours, corresponding to 23%
	Category 2: Initiated by the teacher with the participation of students
	In total 45 hours, corresponding to 41%
	Category 3: Initiated by students, with the participation of students
	In total 40 hpurs, corresponding to 36%
	Category 4: Initiated by students, with the participation of teachers
	N/A
Resources:	Eriksen, Åge Bredahl: Compendium: Renewable energy Niels G. Mortensen, April 2012: Planning and Development of Wind Farms: Wind Resource Assessment and Siting. WAsP computer program
Additional information:	

Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	GBE 8th semester; Elective for the specialisation Sustainable Energy 2017 Feb-Jun MA 6th semester; Compulsory for the specialisation Sustainable Energy 2017 Feb-Jun ME 6th semester; Compulsory for the specialisation Sustainable Energy 2017 Feb-Jun ME Exchange Sustainable Energy 2017 Feb-Jun

12.2.1 n

Personal Communication and Competence, ME-PKO1	
Title:	Personal Communication and Competence
Code:	ME-PKO1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Inge Lundrup
ECTS-point:	4
Prerequisites:	Admission requirements
Internal prerequisites:	
Main purpose:	• To strengthen the student's awareness of his/her own competences and the competences of others in personal communication (PKO) • To give the student an understanding of the connection between conduct, personality and communicative competences. • To increase the student's awareness of strengths and focus areas in relation to personal communication, personal development and change. • To provide the student with the tools and methods to communicate clearly and with clout in various situations (i.e. in connection with job search, negotiations and conducting meetings) • To increase the student's awareness of non-verbal communication.
Key words:	Personal profile, efficient personal communication, dialogue and collaboration with others, assertion theory, transaction analysis, presentation techniques, meeting management, negotiation techniques
Topics:	DiSC Person Profil System as tool to increase one's own strength and focus areas as well as those of others: • More efficient personal communication • Improved collaboration and dialogue with others Tools and methods for personal communication: • Assertion theory • Transaction analysis • Non-verbal communication and active listening Practical use of personal communication in the form of: • Presentation techniques • Meeting management • Negotiation techniques
Knowledge:	
Skills:	
Competences:	Upon completing the course, the student must be able to: • Use the DiSC Person Profil analysis as a tool to understand herself/himself and others • Communicate clearly and efficiently in accordance with the expectations in the specific situation • Use active listening • Plan and complete a presentation creating an overview and insight in an engaging and varied way • Conduct a meeting and participate actively in a negotiation process.
Teaching methods and study activities:	110 hours per student. The teacher assisted lessons will consist of lectures, role plays, cases and practical exercises. Video footage of the students' role plays, the use of instruction videos. There will also be group work.
Evaluation:	

Examination:	Examination attendance requirements:
	Min. 80% active attendance in the course
	Type of examination:
	Mandatory oral exam together with ME-SEP6
	Allowed tools:
	None
	Internal/External censorship:
	None
	Additional comments:
	For more information, please see ME-SEP6
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Teaching of scheduled lessons • Project counselling • Exam In total 26 hours, corresponding to 24%
	Category 2: Initiated by the teacher with the participation of students
	• Solving assignments, self-study • Project work and group work • Preparation for lessons and exams In total 74 hours, corresponding to 67%
	Category 3: Initiated by students, with the participation of students
	• Self-preparation for lessons and exams • Project work • Self-study activities • Study groups • Searching for literature In total 10 hours, corresponding to 9%
	Category 4: Initiated by students, with the participation of teachers
	In total 0 hours, corresponding to 0%
Resources:	Anne Latour & Jørgen Filtenborg: Kommunikation og personlig udvikling (Forlaget Klim, 2003). Notes and handouts are to read on Studynet
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	

12.2.2 Semester course autumn 30 ECTS

12.2.2 a

Automatic Control, Systems and Control Methods, ME-AUC1	
Title:	Automatic Control, Systems and Control Methods
Code:	ME-AUC1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Per Ulrik Hansen, Peter Bjerg
ECTS-point:	4
Prerequisites:	Basic engineering calculus, mechanical engineering disciplines (dynamics, kinematics) and electrical engineering disciplines (DC and AC circuit analysis).
Internal prerequisites:	
Main purpose:	To analyse a technical system, to specify control requirements, and to select control strategy and controller
Key words:	Transfer functions, Bode plots, feedback, transient response, frequency response, PID control, single loop, cascade control, feed forward control, servo control, process control, reference tracking, disturbance rejection
Topics:	• The structure and elements of a control system • Analysis of systems (transients and frequency response), using Laplace transform and simulation • Control strategies (simple feedback, cascade feedback, feed forward) • Stability and transient behaviour. • Selection of controller (P, PI, PD, PID), and determent of controller parameters • Analytic (Bode plot) and experimental controller (process reaction/ sustained oscillation) tuning • Static and dynamic response • Reference tracking and disturbance rejection • Analysis of closed loop response, using mathematics and using simulation.
Knowledge:	
Skills:	The student can describe a technical system, select a proper control strategy, and estimate controller parameters, taking reference tracking, disturbance rejection, stability and dynamics into consideration.
Competences:	The student can analyse a minor technical system, to specify control requirements, and select control strategy and controller.
Teaching methods and study activities:	
Evaluation:	
Examination:	Examination attendance requirements: Mandatory course activities completed Type of examination: Individual oral examination based upon a subject found by draw. No preparation Allowed tools: Internal/External censorship: Internal Additional comments:
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities: Category 1: Initiated by the teacher with the participation of teachers and students Hours 30 – 27% Category 2: Initiated by the teacher with the participation of students Hours 30 – 27% Category 3: Initiated by students, with the participation of students

	Hours 50 – 45% Category 4: Initiated by students, with the participation of teachers
Resources:	1. Katsuhiko Ogata: Modern Control Engineering, 5th edition 2. Supplementary notes
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	

12.2.2 b

Automatic Control, Digital Control and Simulation, ME-AUC2	
Title:	Automatic Control, Digital Control and Simulation
Code:	ME-AUC2
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Per Ulrik Hansen
ECTS-point:	4
Prerequisites:	Control systems general, basic engineering calculus, dynamics, kinematics, DC and AC circuit analysis, Laplace transforms, process modelling and simulation, PID control basics.
Internal prerequisites:	
Main purpose:	The student can control servo systems and processes with digital controllers
Key words:	Digital control, digital process control, computer, interface, sensor, actuator, experimentation, simulation, PLC
Topics:	· Practical aspects of PID control (issues in implementing controllers (e.g. reset windup, noise) and different forms of PID controllers) · Practical tuning methods · Control of laboratory process systems (PLC using BASIC, PC using Simulink, Rockwell PLC)
Knowledge:	
Skills:	The student can identify the parts of a system and decide a control method (simple loop, cascade loop, feed forward), determine a proper controller and tune control parameter
Competences:	The student can control servo systems and processes with digital controllers, considering single loop as well as multi loop controllers, and choosing sample rate and other acquisition parameters.
Teaching methods and study activities:	
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory course activities completed and accepted Test(s)/ Lab tests completed and accepted
	Type of examination:
	Evaluation of course activities
	Allowed tools:
	All
	Internal/External censorship:
	None
	Additional comments:
	Grade is given on the basis of a practical assignment
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	Hours 30 – 27%
	Category 2: Initiated by the teacher with the participation of students
	Hours 60 – 55%
	Category 3: Initiated by students, with the participation of students
	Hours 20 – 18%
	Category 4: Initiated by students, with the participation of teachers
Resources:	1. [CEN]: J. Wilkie, M. Johnson, R. Katebi: Control Engineering (Palgrave) ISBN: 0-333-77129-X. 2. Supplementary notes.
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	

12.2.2 c

Advanced Mechanics of Materials and Welded Structures, ME-AWS1	
Title:	Advanced Mechanics of Materials and Welded Structures
Code:	ME-AWS1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Jon Svenninggaard
ECTS-point:	4
Prerequisites:	Knowledge of mechanics of materials and the metallurgy of steel. For full degree students, this is covered in the course ME-MME1. Basic knowledge about the finite element method. This is covered in the course ME-FEM1
Internal prerequisites:	ME-MME1, ME-FEM1
Main purpose:	To enable the student to apply more advanced theory, knowledge and common engineering standards to real life structural problems and designs.
Key words:	Buckling, welded connections, theory of elasticity, bolted connections, Eurocode, DNV-GL.
Topics:	- Elastic stability and buckling of beams and shells - Codes - Materials for steel structures - Welding technology - Calculation of joints - Fatigue of welded joints - Bolted joints - Fatigue of bolted joints - Practical design
Knowledge:	- Codes of relevance for steel structures, mainly Eurocode 3 and DNV. - Modes of failure for steel structures, buckling of columns and plates. - Calculation of welded and bolted joints. - Practical considerations in the design of steel structures. - Fatigue calculations of welded joints. - Numerical methods to evaluate weld stress and fatigue life.
Skills:	The student will be able to make design calculations on slender structures, plates and columns. Be able to assign non- destructive test methods to various types of welds. Design welded and bolted joints. Evaluate the lifetime of a component or welded joint subjected to fatigue.
Competences:	The student will be able to take part in development projects on higher levels within various industries, which could include wind turbines, oil rigs, ships, bridges, buildings, masts, chimneys and many others. Be able to judge if the structural part can or should be designed according to a specific code or not.
Teaching methods and study activities:	4 ECTS resembles a work load of 110 hours.
Evaluation:	
Examination:	**Examination attendance requirements:**
	None
	Type of examination:
	Written
	Allowed tools:
	All
	Internal/External censorship:
	Internal
	Additional comments:
	N/A
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Teaching of scheduled lessons • Theory and assignments solving

	In total 36 hours, corresponding to 33%
	Category 2: Initiated by the teacher with the participation of students
	• Problem solving • Preparation for examination • Examination Preparation for the classes Midterm evaluation In total 44 hours, corresponding to 40%
	Category 3: Initiated by students, with the participation of students
	• Self-study Preparation for the exams Literature search In total 30 hours, corresponding to 27%
	Category 4: Initiated by students, with the participation of teachers
	N/A
Resources:	Notes will be handed out during the lessons.
Additional information:	Recommended literature: [2] Bonnerup, Bent, et. Al; Stålkonstruktioner efter DS/EN 1993; Nyt teknisk forlag; ISBN 978-87-571-2683-9 (Danish) [2] Fatigue Handbook, Offshore Steel Structures, edited by A. Almar-Næss, Tapir, 1985. Latest edition. [3] Fuchs, H.O. and R.I. Stephens, "Metal Fatigue in Engineering", John Wiley & Sons,1980. Latest edition
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Mechanical Engineering; 7th semester; Elective for the specialisation Innovation and Product Design; Elective for the specialisation Sustainable Energy;

12.2.2 d

CNC Virtual Simulation, ME-CRS1	
Title:	CNC Virtual Simulation
Code:	ME-CRS1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Kim Rask Petersen
ECTS-point:	4
Prerequisites:	Basic knowledge of 3D CAD system "Inventor" or another similar CAD system (Solidworks, SolidEdge, PRO etc.) The minimum level is the one achieved in the course ME-CAD1 (Basic Inventor).
Internal prerequisites:	
Main purpose:	To introduce the student to the kinematic and general functionality of CNC multi axis machines in such a way and at such a level, that the student will be able to build and run virtual CNC equipment and solve CAM programming tasks.
Key words:	
Topics:	**Introduction to 4-5 axis CNC machines** • **Design and build virtual/digital 4-5 axis machines** • **Create necessary CAD models and components** • **Assemble the CAD models** • **Define kinematic, velocity profile and limits for the different components in the CNC equipment** • **Prismatic (2½D) and 5 axis CAM programming.** • **Simulate the CAM programming against the virtual CNC equipment.** • **In real world measure and "copy" a 4-5 axis CNC machine, build the virtual model and simulate own developed CAM programme.** • **Cutting and tool technology.** • **Tool Libraries and process planning** • **ISO code for CNC equipment.** • **Postprocessors and G-code simulation.**
Knowledge:	The course is focused around the software Siemens NX, and the student will gain some experience using this software. The most important topic is to achieve a deeper understanding of the design, kinematic, operation and programming of manufacturing multi axis CNC-equipment.
Skills:	An understanding of the functionality and potential use of CNC production equipment.
Competences:	The student will gain competences using Siemens NX by the design and building of virtual/digital production equipment. The most important competence, however, is the understanding of the importance and industrial potential in simulating production processes. The student will work with 4-5 axis CNC machines in real environment and after the investigation, to build the same machine as virtual and digital model.
Teaching methods and study activities:	3 lessons per week for 12 weeks. A minimum of 110 hours is expected. It must be emphasized, that without a proper amount of hours spent on exercises, the course is very difficult to pass. The lessons are composed in such a way, that half the lessons are theory, the rest are practical exercises with the software Siemens NX. Some lessons are spent with practical work in the workshop, working with real 4-5 axis CNC machines. 4 ECTS resembles a work load of 110 hours.
Evaluation:	
Examination:	Examination attendance requirements:
	Course assignment handed in before deadline
	Type of examination:
	Group presentation followed by an individual examination with the presence of the whole group. Duration of presentation: 15 - 20 minutes
	Allowed tools:
	None

	Internal/External censorship:
	Additional comments:
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Classroom teaching • Supervision In total 36 hours, corresponding to 33%
	Category 2: Initiated by the teacher with the participation of students
	Problem solving • Preparation for the classes • Midterm evaluation • Cases and exercises In total 44 hours, corresponding to 40%
	Category 3: Initiated by students, with the participation of students
	• Course Project • Literature search In total 30 hours, corresponding to 27%
	Category 4: Initiated by students, with the participation of teachers
	N/A
Resources:	Literature and manuals will be handed out as PDF files free of charge. Software will be available as student versions during the semester period.
Additional information:	**The software Siemens NX will be offered free of charge for installation on the student's laptop.**
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	GBE 9th semester; Elective for the specialisation Intelligent Mechanics and Systems; 2016 Aug-Jan MA 7th semester; Elective for the specialisation Innovation and Product Design; Elective for the specialisation Intelligent Mechanics; 2016 Aug-Jan ME 7th semester; Elective for the specialisation Innovation and Product Design; Elective for the specialisation Intelligent Mechanics; 2016 Aug-Jan Exchange Innovation and Product Design. Intelligent Mechanics; 2016 Aug-Jan

12.2.2 e

Drives, ME-DRV	
Title:	Drives
Code:	ME-DRV
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Bo Leander Gylling
ECTS-point:	4
Prerequisites:	Basic knowledge of gear systems and hydraulic systems
Internal prerequisites:	
Main purpose:	Being able to design and dimension an advanced mechanical or hydrostatic drive system and choose the practical useable components. It is central that the student test theory in practice through laboratory work to gain a deeper understanding of science issues.
Key words:	
Topics:	Design and dimension of Hook's joints: Calculation of velocity variations, acceleration, compensation techniques. Calculation and measuring methods for finding the mass moment of inertia of the machine. Equation system and design of planet or epicyclical gears. Spur gear in general with force calculations. Control and regulation of mobile hydraulic systems - Open and closed hydraulic circuits. Pump and motor types - Performance curves. Design and control of valve actuator system. Complex hydraulic circuits with load sensing, priority and combined linear and rotational actuator systems.
Knowledge:	The student will gain knowledge of how mechanical and hydrostatic drives are build, work and can be used in machine constructions of mobile equipment.
Skills:	The student will have skills in selecting correct machine elements through product specifications, calculate for an optimal size of these elements and connect them physically in to a well-functional drive system.
Competences:	The student will understand how analysis of mechanical and hydrostatic drives are to be carried out in order to find a solution. The student will be able to explain the theory behind the calculations for a complex machine system. He/she will collect analysis results and combine these to describe the design for making a complex system. They will be able to communicate their needs to suppliers of machine elements, and be able to find these suppliers through relevant channels. The student will be able to evaluate different possible solutions, to set up the most optimal system in a given situation.
Teaching methods and study activities:	12 weeks, 48 lessons in total, of which 12 lessons are for assignment help. Activities during the course are theory, problem solving and work in classes. Minimum one week is used for supervision in the course examination and repetition. Expected workload for the student is 110 hours Teaching will balance theory and small exercises
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory course activities completed
	Type of examination:
	Individual oral examination based upon a subject found by draw. Preparation time 20 minutes.
	Allowed tools:
	All
	Internal/External censorship:
	External
	Additional comments:
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	· Education, scheduled lessons · Examination

	In total 48 hours, corresponding to 44%
	Category 2: Initiated by the teacher with the participation of students
	· Problem solving, self-study · Group work · Preparing for classes and exams · Evaluation of teaching In total 50 hours, corresponding to 45%
	Category 3: Initiated by students, with the participation of students
	· Own preparation for classes and exams · Self-study activities · Literature search In total 12 hours, corresponding to 11%
	Category 4: Initiated by students, with the participation of teachers
	· Debate Events · Study In total 0 hours, corresponding to 0%
Resources:	· Notes given i class · Steven R. Schmid - Fundamentals of Machine Elements · Andrew Parr, Hydraulics & Pneumatics.
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Mechanical Engineering; 7th semester; Elective for the specialisation Intelligent Mechanics

12.2.2 f

Expert Systems, Fuzzy Logic and Neural Networks, ME-EFN1	
Title:	Expert Systems, Fuzzy Logic and Neural Networks
Code:	ME-EFN1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Per Ulrik Hansen
ECTS-point:	4
Prerequisites:	Basic control system theory, Laplace transform, PID controller, feedback systems, process modelling and simulating.
Internal prerequisites:	
Main purpose:	Introduction to expert systems and Introduction to Fuzzy control as an alternative to classical controller (e.g. PID control), and introduction to neural networks.
Key words:	Fuzzy logic, fuzzy control, nonlinear systems, expert systems, simulation, MatLab, neural networks
Topics:	**Fuzzy** • Fuzzy logic and its application • Fuzzy sets, relations and reasoning • Building expert systems (design and applications) • Automatic control using fuzzy (design and applications) • Programming fuzzy systems with Matlab • Simulation of fuzzy control with simulink, e.g. the Segway **Neural networks** • Neural networks and its applications • Architecture of neural networks, the learning process and applications
Knowledge:	The student can explain Fuzzy logic, fuzzy control, nonlinear systems, expert systems, simulation with MatLab and neural networks
Skills:	The student can develop and simulate Fuzzy and Neural systems, using simulink
Competences:	The student can design and implement a fuzzy expert system and a fuzzy controller, and program it in MatLab. Also, the student can apply neural networks for simple decision making
Teaching methods and study activities:	36 class lessons, lectures, problem solving Laboratory exercises Major course Work
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory course activities completed
	Type of examination:
	Individual oral examination without preparation based upon course assignment
	Allowed tools:
	Internal/External censorship:
	Additional comments:
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	Hours 30 – 27%
	Category 2: Initiated by the teacher with the participation of students
	Hours 30 – 27%
	Category 3: Initiated by students, with the participation of students
	Hours 50 – 45%
	Category 4: Initiated by students, with the participation of teachers
Resources:	Notes

Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	

12.2.2 g

Advanced Finite Element Methods, ME-FEM2	
Title:	Advanced Finite Element Methods
Code:	ME-FEM2
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Jon Svenninggaard
ECTS-point:	4
Prerequisites:	Knowledge of mechanics of materials and the metallurgy of steel. For full degree students, this is covered in the course ME-MME1. Knowledge of vector and matrix algebra is important. Good knowledge about the general finite element method
Internal prerequisites:	ME-MME1, ME-ESC2, ME-FEM1
Main purpose:	To enable the student to apply theories, techniques and concepts within the finite element method for linear and nonlinear applications applied to practical problems from industry.
Key words:	FEM, FEA, finite element method, simulation, nodes, elements, mathematics, math, nonlinear problems, nonlinear materials.
Topics:	The course will include the following topics: - Static stress analysis - Element technology - Validation of the FE model (Mesh convergence, check of reaction forces etc.) - Error estimation and adaptive mesh generation - Free vibration analysis (Eigenfrequency problems) - Structural dynamics problems - Static geometrically nonlinear systems - Behaviour of nonlinear systems - Nonlinear solution methods - Linearized buckling analysis - Pre-stressed free vibration analysis - Contact analysis - Constraint equations (MPC's) - Nonlinear material modelling and analysis
Knowledge:	The student will gain knowledge about the FE method and its applications. He or she will gain an understanding of how the method works and will be able to solve simple problems analytically and using commercial software.
Skills:	The student will be able to make design calculations on slender structures, plates and columns. Be able to assign non- destructive test methods to various types of welds. Design welded and bolted joints. Evaluate the lifetime of a component or welded joint subjected to fatigue.
Competences:	After taking the course, the student will be able to judge the possibilities in using commercial FE software in linear static problems.
Teaching methods and study activities:	4 ECTS resembles a work load of 110 hours. There will be 12 weeks with lectures, which consists of 3 lessons a week. The lessons will be part theory ex cathedra as well as tutorials. Some tutorials will be conducted as workshops in groups or individually, where the student will be presenting his/her results in front of the rest of the class.
Evaluation:	
Examination:	**Examination attendance requirements:**
	The examination is conducted as an oral examination. The duration will approximately be 20 minutes per student. The questions for the examination are disclosed during the semester. One of these questions is picked in a lottery at the examination.
	Type of examination:
	Oral
	Allowed tools:
	None
	Internal/External censorship:
	Internal
	Additional comments:
	In order to enter the examination, a good performance and attendance

	must be shown in each of three workshops conducted during the semester.
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Classroom teaching • Assignments supervision In total 36 hours, corresponding to 33%
	Category 2: Initiated by the teacher with the participation of students
	• Problem solving • Preparation for the classes • Preparation for the examination • Examination • Midterm evaluation • Assignments In total 44 hours, corresponding to 40%
	Category 3: Initiated by students, with the participation of students
	• Self-study • Preparation for the classes • Literature search In total 30 hours, corresponding to 27%
	Category 4: Initiated by students, with the participation of teachers
	N/A
Resources:	Required: Cook, Robert D. [Et al]; Concepts and applications of finite element analysis; Latest edition; Wiley; ISBN 978-0471-35605-9
Additional information:	N/A
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	Mechanical Engineering; 7th semester; Elective for the specialisation Innovation and Product Design; Elective for the specialisation Sustainable Energy; Aug – Jan 2016 Exchange; Mechanical engineering classic, Aug – Jan 2016

12.2.2 h

Geometrical Dimensioning, Tolerancing and Inspection, ME-GDT1	
Title:	Geometrical Dimensioning, Tolerancing and Inspection (GD&T)
Code:	ME-GDT1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Kim Rask Petersen
ECTS-point:	4
Prerequisites:	Basic knowledge of 3D CAD system "Inventor" or another similar CAD system (Solid works, Solid Edge) and a basic knowledge of GD&T tolerancing. General knowledge about production and tooling processes.
Internal prerequisites:	
Main purpose:	Ensuring unambiguous and optimized documentation in relation to product design, manufacturing and tests, and to supply the student with a deep theoretical and practical understanding of GD&T tolerancing and measuring methods. To give an introduction to industrial used measuring methods (Bluelight Scanning, Probing and Laser) for measuring and documenting ED&T requirements. It's important to understand the strength and weaknesses in the different methods To introduce inspection software, that measures, documents and visualises deviations from the required GD&T tolerances or documents deviation from more used standard tolerances and surface requirements.
Key words:	
Topics:	**Part1 (5 weeks)** o Introduction to GD&T standard and practice o Datum systems o TED, o Tolerances of Form o Orientation Tolerances o Location Tolerances o Runout Tolerances o Practical exercises **Part2 (4 weeks)** o Introduction to inspection software. As an inspection software IMInspect is used. o Alignment of parts inside IMInspect- and the importance of alignment on the final result o Defining GD&T data compared to more normal tolerance data o Reporting errors and deviations o Statistic on process flow SPC (Cp and Pp values) o Section Analyses o Customising and automation of the inspection process o Visit company with a Robot/Scan solution for quality control. **Part 3 (3 weeks)** o Practical work with different measuring equipment (Blue Ligth, Probes) o Course Assignment
Knowledge:	
Skills:	
Competences:	The student will get a deep understanding of the GD&T tolerancing – and especially tolerancing in a practical approach. To understand the inspection process and reporting errors, the student will achieve competences within the inspection software IMInspect – and understand the importance of dedicated alignment – because different alignments give different results.
Teaching methods and study activities:	The course is divided in 3 sections. The first 5 weeks with traditional class room teaching and studies of the theory and practice behind GD&T.

	The following 4 weeks are very much focused on working with software IMInspect – and cases from the industry. The last 3 weeks are dedicated to workshop and practical work with the technology. REMARKS: The number of participants is limited to 28 due to the number of licenses.
Evaluation:	
Examination:	**Examination attendance requirements:**
	Mandatory course activities completed and accepted
	Type of examination:
	Allowed tools:
	All
	Internal/External censorship:
	Internal
	Additional comments:
	None
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: · Classroom teaching · Project supervision In total 48 hours, corresponding to 44 %
	Category 2: · Problem solving · Preparation for the classes · Midterm evaluation In total 22 hours, corresponding to 20 %
	Category 3: · Course Project · Preparation for the tests · Literature search In total 40 hours, corresponding to 36 %
	Category 4: N/A
Resources:	Literature and manuals will be handed out as PDF files
Additional information:	The software IMInspect will be distributed during the first 5 weeks and is available for each student for free. It is expected, that each student has a personal laptop sufficiently configured to run the software.
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	

12.2.2 i

Innovation and Product Design, ME-IPD1	
Title:	Innovation and Product Design
Code:	ME-IPD1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Ole Hansen-Skovmoes and Martin Møhl
ECTS-point:	4
Prerequisites:	The course is directed to students on a 7th semester level being familiar with basic engineering skills within: Materials and processing processes, design methods including technical drawing, basic business economics and project work in groups. The course also welcomes students with qualifications within related fields such as industrial design, marketing etc.
Internal prerequisites:	
Main purpose:	The purpose of the course is to enable the student to efficiently navigate in an R&D environment by utilising already acquired engineering skills and competences gained in previous studies.
Key words:	Innovation process, idea methods, decision process, sketch and drawings.
Topics:	• Business case • Design process • Design methods • Clarifying objectives • Technical Product Specification • Establishing functions • Generating alternatives • Evaluation of alternatives • Product development - from ideas to sketches.
Knowledge:	The student is to gain knowledge within the following areas: · Doing R&D with a business perspective. · The design process: Task definition, innovation, evaluation and execution · Establishing efficient development teams. · Receiving and giving information.
Skills:	The student is to be familiar with: · Possibilities, methods and principles for innovative processes. · Assessment of solution propositions in a business, risk and functionality perspective. · Selecting relevant methodology in the different stages of the development process. · The potentials for synergy and set back when working in teams.
Competences:	After completing the course, the student will be able to conduct the innovative parts of the R&D process taking into account internal and external stakeholders
Teaching methods and study activities:	One semester of 12 weeks. Activities during the course are theory, problem solving, work in computer rooms and library, study cases, and a major course assignment.
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory assignments handed in before deadline and accepted
	Type of examination:
	Group presentation followed by an individual examination with the presence of the whole group. Duration of presentation: 15-20 minutes.
	Allowed tools:
	Internal/External censorship:
	Additional comments:
Grading criteria:	The Danish 7 point scale

Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Teaching of scheduled lessons • Excursions • Project counselling • Laboratory work • Exams, tests hours 30 %
	Category 2: Initiated by the teacher with the participation of students
	• Solving assignments, self-study • Project work and group work • Preparation for lessons and exams • Evaluation of lessons Hours 40 %
	Category 3: Initiated by students, with the participation of students
	• Individual preparation for lessons and exams • Project work • Self-study activities • Study groups • Searching for literature Hours 20 %
	Category 4: Initiated by students, with the participation of teachers
	• Debates • Study counselling Hours 10 %
Resources:	
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	

12.2.2 j

Materials and Design ME-MAD1	
Title:	Materials and Design
Code:	ME-MAD1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Yoke-Chin Lai (Ph.D.)
ECTS-point:	4
Prerequisites:	Basic knowledge in design, materials science and mechanics of materials
Internal prerequisites:	
Main purpose:	The course is to polish the product design skills of the student through integrating the industrial design method into the engineering design method. The course will provide a fundamental knowledge to relate many aspects including materials, processing technologies, social, aesthetics and sustainability , in an attempt to form a holistic perspective in the product design practice.
Key words:	Material's structure and properties, materials in contexts, materials processing techniques, product design process, rapid prototyping, design models
Topics:	1. Material's structure and properties: metal, plastic, textiles, wood. 2. Materials in context: functional, social, cultural, environmental and aesthetical. 3. Materials and Processing Technologies selection. 4. CES Edupack 5. Product design process: needs identification, ideas generation (scenarios, sketches, etc.), design brief, etc. 6. Appropriate Paper Technology (APT) 7. Prototyping – Full/partial functioning
Knowledge:	The student will be equipped with the essential knowledge of product design process in which a holistic perspective is emphasized to bridge the engineering design process with the industrial design process. The student will learn to use the essential product design methods and tools to identify user requirements followed by translating them into the relevant design attributes.
Skills:	Throughout the course, all student is guided to practice essential skills in managing an open-ended design project. The skills of concerned include applying relevant methods and tools in design problem exploration (e.g. mood-board, persona), design idea generation and selection (e.g. final theme board), and low-fidelity prototype making (e.g. Appropriate Paper Technology), thinking critically in material choosing from not only the technical perspectives but also the aesthetic, association and perception perspectives.
Competences:	The course content is divided into two areas: materials and design. Upon the completion of the course the students will be able to: 1. understand how the nature of materials influences design, development and use: a. characterise materials based on the material properties b. relate material's structure to the properties of materials c. select appropriate materials based on their structure and properties d. explain how material structure and properties influence design, development and use. 2. design products that meet user needs a. investigate issues, values, needs and opportunities to formulate a design problem. b. devise and generate ideas to solve the formulated problem. c. produce solutions to the problem. d. demonstrate one final chosen solution through various possible means, including prototyping.
Teaching methods and study activities:	1. Course project: complete one (1) design project either in group or individually depending of the instruction given by the instructor. The course project forms the basis for the final assessment to the students. 2. Assignment: A few assignments will be given throughout the semester for the student to complete either individually and/or in

	group. 3. Student seminar or design studio: Each student is required to present the outcomes of the assignment and course project in the seminar and/or studio. 4. Lectures 5. Reading: read the assigned reading before coming to class. 6. Group discussion: A frequent activity for completing small exercises given in the lectures. 7. Peer reviewing: Each student needs to actively give feedback to his/her peer's works presented in the student seminars. 8. Self-assessment: Reflection is a crucial activity for effective learning. Assess his/her own performance in comparison to the given criteria will help to reflect on his/her work.
Evaluation:	
Examination:	**Examination attendance requirements:**
	Course assignment submitted by deadline
	Type of examination:
	Group presentation followed by an individual examination with the presence of the whole group. Duration of presentation: 15 - 20 minutes
	Allowed tools:
	All
	Internal/External censorship:
	External
	Additional comments:
	None
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	• Teaching of scheduled lessons • Excursions • Project counselling • Laboratory work • Exams, tests In total 33 hours, corresponding to 30%
	Category 2: Initiated by the teacher with the participation of students
	• Solving assignments, self-study • Project work and group work • Preparation for lessons and exams • Evaluation of lessons In total 27.5 hours, corresponding to 25%
	Category 3: Initiated by students, with the participation of students
	• Individual preparation for lessons and exams • Project work • Self-study activities • Study groups • Searching for literature In total 44 hours, corresponding to 40%
	Category 4: Initiated by students, with the participation of teachers
	• Debates • Study Counselling In total 5.5 hours, corresponding to 5%
Resources:	1. Ashby, M. & Johnson, K. (latest edition), Materials and Design, The art and Science of Material Selection in Product Design, Elsevier.

Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	ME: 7. semester; Compulsory for the specialization Innovation and Product Design; 2016 Aug-Jan MA: 7. semester; Compulsory for the specialization Innovation and Product Design; 2016 Aug-Jan GBE: 9. semester; Elective for the specialization Innovation and Product Design; 2016 Aug-Jan ME Exchange: Innovation and Product Design; 2016 Aug-Jan

12.2.2 k

Experimental Robotics, ME-RMS2	
Title:	Experimental Robotics
Code:	ME-RMS2
Ver.:	1.0
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Per Ulrik Hansen
ECTS-point:	4
Prerequisites:	
Internal prerequisites:	
Main purpose:	The student can simulate and program a robot for industrial applications
Key words:	Robot simulation, robot programming
Topics:	• Simulation of robots • Programming robots
Knowledge:	
Skills:	The student can simulate and program a robot for industrial application
Competences:	The student can simulate and program a robot for industrial application
Teaching methods and study activities:	
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory course activities completed and accepted Test(s)/ Lab tests completed and accepted
	Type of examination:
	Evaluation of course activities
	Allowed tools:
	All
	Internal/External censorship:
	None
	Additional comments:
	Grade is given on the basis of a practical assignment
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	12 hours = 11%
	Category 2: Initiated by the teacher with the participation of students
	38 Hours = 35 %
	Category 3: Initiated by students, with the participation of students
	60 hours = 54%
	Category 4: Initiated by students, with the participation of teachers
Resources:	ABB robotic simulation software Hyundai robotic programming software
Additional information:	
Valid from:	01-02-2017
Approved by:	Carsten Nielsen (CARN) | VIA
Course type:	Elective course for Mechanical Engineering; 7th semester Elective course for Mechanical Exchange

12.2.2 I

Simulation of Energy Systems and Energy Storage, ME-SES1	
Title:	Simulation of Energy Systems and Energy Storage
Code:	ME-SES1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Carsten Nielsen
ECTS-point:	4
Prerequisites:	ME-TER1, ME-ENE1, ME-DES1 (or simultaneously with ME-DES1)
Internal prerequisites:	
Main purpose:	The student will obtain knowledge of energy storage systems and be able to make analysis/simulations of thermal energy storage and non-stationary energy systems.
Key words:	Thermal energy storage, electrical energy storage, heat transfer analysis, evaluation of temperature changes, computer simulations of various energy systems.
Topics:	Thermal energy storage (pit, borehole, ATES, water tank), thermal solar collectors, industrial heating systems, heat flow analysis and computer simulations of various energy systems.
Knowledge:	Know the design and structure for energy storage and carry out energy balance for the system. Calculate main dimensions, capacities and losses for storage of thermal energy. Make energy analysis and calculate temperature changes for non-stationary heat flow processes. Carry out computer simulations for changes in different energy systems like storage charging and discharging, mixing of flows, changing of thermodynamic cycle and optimize energy streams..
Skills:	The student will be able to analyse the correlation between energy consumption, storage and production and to evaluate storage solutions, calculate storage capacities and carry out software simulations for renewable and industrial thermal energy systems.
Competences:	The course will give the student competences in designing a thermal solar system including short term and seasonal storage. Furthermore, the student will be able to communicate and collaborate with energy engineers about storage and operation of energy systems.
Teaching methods and study activities:	4 ECTS resembles a work load of 120 hours. There will be 12 weeks with lectures, which consists of 3 lessons a week. The lessons will be part theory and cases as well as tutorials. Some tutorials will be conducted as compulsory mini projects in groups and individually. Cases will be studied in groups and presented in front of the rest of the class. .
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory assignments handed in before deadline and accepted
	Type of examination:
	Individual oral examination without preparation based upon course assignment(s)
	Allowed tools:
	None
	Internal/External censorship:
	External
	Additional comments:
	Course assignments Indicative influence on grade: 50%
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	In total 25 hours, corresponding to 23%
	Category 2: Initiated by the teacher with the participation of students
	In total 45 hours, corresponding to 41%
	Category 3: Initiated by students, with the participation of students
	In total 40 hours, corresponding to 36%
	Category 4: Initiated by students, with the participation of teachers
	N/A

Resources:	Compendium and collection of cases on Studynet TRNSYS 17 simulation software
Additional information:	
Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	GBE 9th semester; Elective for the specialisation Sustainable Energy 2016 Aug-Jan MA 7th semester; Compulsory for the specialisation Sustainable Energy 2016 Aug-Jan ME 7th semester; Compulsory for the specialisation Sustainable Energy 2016 Aug-Jan ME Exchange Sustainable Energy 2016 Aug-Jan

12.2.2 m

Vision Systems, Cameras, Software and Applications, ME-VIS1	
Title:	Vision Systems, Cameras, Software and Applications
Code:	ME-VIS1
Ver.:	1.1
Language:	EN
Offered by:	Mechanical Engineering
Responsible:	Per Ulrik Hansen
ECTS-point:	4
Prerequisites:	Basic computer programming and calculus.
Internal prerequisites:	
Main purpose:	The student can develop a machine vision system for quality control or pattern recognition
Key words:	Machine vision, illumination, camera, image enhancement, pattern recognition, decision theory, MatLab
Topics:	• Structure of machine vision system • Applications of machine vision • Illumination, cameras, software • Image enhancement, segmentation and feature extraction • Image (photo) improvement software • Methods for pattern recognition and decision theory • Software for machine vision (MatLab, NeuroCheck) • Experimentation in the Laboratory
Knowledge:	The student can explain the structure of Machine vision, illumination, camera, image enhancement, pattern recognition, decision theory, and how to use MatLab
Skills:	The student can modify the structure of vision systems, explain image formats and use different methods to improve images (also photographs), extract features, demonstrate decision making and recognize patterns (for recognition of a specific leaf).
Competences:	The student can develop a machine vision system for quality control or pattern recognition
Teaching methods and study activities:	36 class lessons, lectures, problem solving Major course work NOTE: The course work can be supported by the course ME-EFN1 (Expert systems, fuzzy logic, control and neural Networks)
Evaluation:	
Examination:	Examination attendance requirements:
	Mandatory course activities completed
	Type of examination:
	Individual oral examination without preparation based upon course assignments
	Allowed tools:
	Internal/External censorship:
	Internal
	Additional comments:
Grading criteria:	The Danish 7 point scale
Study activity model:	Distribution of the course Study activities:
	Category 1: Initiated by the teacher with the participation of teachers and students
	In total 30 hours, corresponding to 27%
	Category 2: Initiated by the teacher with the participation of students
	In total 30 hours, corresponding to 27%
	Category 3: Initiated by students, with the participation of students
	In total 50 hours, corresponding to 45%
	Category 4: Initiated by students, with the participation of teachers
Resources:	Notes
Additional information:	

Valid from:	01-08-2016
Approved by:	Uffe Stæhr (UFST) | VIA
Course type:	

13 Revision chart

The dates of revisions indicate the most recent publication of a revised page.

Date of revision	Pages

Uffe Stæhr
Head of Programme

August 2016