BUSINESS ACADEMY AARHUS
UNIVERSITY OF APPLIED SCIENCES

Curriculum Part 3 - electives

Automotive Technology (AP), Elective Elements

Autoteknolog (AK)

Effective date 15 AUGUST 2017

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Contents - part 3

1. Scope of the curriculum

1.1. Commencement of the curriculum

The curriculum part 3, electives elements is valid from 01.08.2017.

2. Completion of the exam, as well as illness and re-exams

2.1. Completion of the exams

In general, the following applies for all programmes in relation to when an exam has been completed or an exam attempt has been used. If there are deviations, they will appear in the individual exam descriptions.

Exam failed
If a student is given less than the mark 02 at an exam, the exam has been failed and one exam attempt will have been used. If an exam project or a written assignment is given less than the mark 02, it is a fail and one exam attempt will have been used.
If the entire examination project was prepared by one student and not passed, the student can choose to work further on the existing project or prepare a new project.
In the event of one student, as part of a group project, not achieving the mark 02 or above, the student can rewrite their section of the joint project. The student can also choose to write a new project, where the rules for individually produced projects apply.

Project not handed in/written answers
If a student does not hand-in their exam project or their written report, one exam attempt will have been used.
The student can choose to work further on their existing project or prepare a new project.

Not participated in the exam/oral examination
If a student hands in their exam project or written answers, but doesn't participate in the oral exam, one exam attempt will have been used.
A new oral exam will be scheduled as soon as possible and the student will be examined in the previously handed in project.

2.2. Sickness and re-examinations

Information about the time and place of sick/re- exams can be found on Campus. This may be the same as the next regular exam. The student is responsible for finding out when the sick and re-exams take place.

Sick exams
A student who has been prevented from taking an examination due to a documented illness or another unforeseen circumstance will be given the opportunity to take a (sick) exam as soon as possible. If it is an exam that is scheduled in the programme's last examination period, the student will be given the opportunity to retake the exam in the same examination period or as soon as possible after.
The illness must be documented by a doctor's certificate. The Academy must receive the doctor's certificate no later than three working days after the examination.
Students who become acutely ill during an exam must prove that they have been ill on that day.

If the illness is not documented according to the above rules, the student will have used an examination attempt. The student bears the cost of the medical certificate. Requirements for the medical certificate can be found on the website www.baaa.dk under 'Worth knowing about exams'.

Re-examination
With a failed exam, or failure to appear for an exam, the student is automatically registered for the re-examination, provided that the student has an exam attempt left. The student is registered to take the exam the next time it is scheduled. The re-examination may be the same as the next regular exam.
The programme may grant an exemption from the automatic registration provided this is justified by exceptional circumstances, including documented disabilities.

3. Elective element

The electives catalogue will be continuously updated, and the current electives' catalogue will be available prior to each semester.

The electives' catalogue contains at present the following electives offered on the 3rd semester:

1. Entrepreneurship (5 ECTS)
2. Chassis dynamics, Design and Optimising (5 ECTS)
3. Engine Mapping (5 ECTS)
4. Electrical system component (5 ECTS)
5. Indicating the Component (5 ECTS)

Assessment
The learning objectives for the elective elements are described under each elective.
The learning objectives will be tested in an exam, which is assessed according to the 7-point scale with an internal co-examiner.

The language used by for exams
The exams are in Danish for students doing autoteknolog, while the exams are in English for students doing Automotive Technology.

3.1. Elective course 1 – Entrepreneurship

Exam weight: 5 ECTS

Content
- Entrepreneurship from idea to business plan
- The entrepreneur's role, conditions and personal qualities
- Entrepreneurial culture and business
- Skills of communication and negotiation.

Learning objectives

Knowledge and understanding
The student will gain knowledge about:
- The role of an entrepreneur and understand how to make use of advisers and set up a network
- How a business plan is prepared
- How an idea is presented to potential stakeholders
- How to market a newly established company
- Financing options for the entrepreneur.

Skills
The student will get the skills to:
- Use basic methods to generate ideas
- Prepare market analyses with the necessary requirements for documentation and a practical action plan for implementing a concrete idea
- Provide financing in the form of budget
- Engage in negotiations on financing or the like, in the implementation of the business plan
- Assess the company's product / market portfolios, skills and resources
- Identify the company's customer relationships and customer purchasing behaviour
- Show the company's strengths, weaknesses and threats and opportunities.

Competencies:
The student will learn to:
- Draw up a business plan and create the conditions for setting up a business
- Be able to sell the idea through the presentation of the business plan.

The exam form and organisation
The exam is an oral exam, based on a written group project. The exam starts with a joint group presentation of the project followed by an examination of the individual student.

There can only be a max of 6 students in one group.

The duration of the examination is 15 min. in total per student, of which:
Group presentation:

- The group presents the project, 5 min/per student (i.e. 5 students equals 25 min. presentation).

Individual examination of the student:

- Questions, 5 min.
- Assessment, 5 min.

The students are awarded an individual overall mark based on an overall assessment of the student's oral performance. The assessment includes the group presentation as well as the students' individual oral performance. The written group project is only a prerequisite to take the exam.

Formal requirements
The project report must at least include:

- Front page with project title and name of participants
- Bibliography (including all sources that have been referenced)
- Appendices *(only include appendices essential to the report)*
- You must attach an appendix which is a log of the group's workflows, assignments and the distribution of tasks in the project group.

The scope of the project depends on the size of the group:

- For each student in the group, the report's scope must be increased by between 7,200 and 9,600 characters (3-4 standard pages)

Prerequisites to take the exam
The following requirements must be met to take the oral exam:

The written group project report must:

- Meet all the formal requirements
- The report must be handed-in on time, in accordance with the exam schedule, which is available on Campus.

Time Placement
The exam is placed in the 3rd semester. Information about the time and place can be found on Campus.

3.2. Elective course 2 – Chassis Dynamics and Optimising

Exam weight: 5 ECTS

Learning objectives
The student will be able to understand:

- Development based knowledge for suspension design and layout
- Centrally applied theory on suspension coordinates determination

- The centrally applied theories for the profession within calculations and recommendations for suspension layout.

Knowledge and understanding
The student will gain knowledge about:

- Centrally applied theory on motion ratio
- The profession's application in relation to e.g. anti-dive, squat and raise
- Furthermore, development based knowledge within spring rate, wheel rate and roll centre
- Load & weight transfer practice within the profession.
- The methodologies applying to the construction and operation of racing cars and the knowledge obtained will be used to understand the principles in the design and the optimisation of racing cars.

Skills:
The student will get the skills to:

- Apply measurement tools for all necessary 'pick up' points on a race car
- Use the measurements to evaluate the different basic solutions
- Analyse basic calculations and accordingly choose solutions based on measured data
- Communicate practice relevant calculations and data to the profession.
- Analyse measurements and data to propose solutions for optimisation.

Competencies:
The student will learn to:

- Participate in and assist with development projects within the field of chassis and suspension design
- Use data to analyse and thereby handle development orientated situations
- Secure optimisation based on data
- Assist race engineers optimise the setup, according to chassis changes
- Construct wishbone and bell crank layout of a chassis during the design stage
- Acquire new knowledge, skills and competencies in relation to suspension design using the learned analysing and optimising skills.

The exam form and organisation
The exam is an individual oral exam.
The exam starts with the student answering a drawn question followed by an examination.

The duration of the examination is 15 min. in total, of which:

- The student answers the drawn question, 5 min.
- Questions, 5 min.
- Assessment, 5 min.

Time Placement
The exam is placed in the 3rd semester. Information about the time and place can be found on Campus.

3.3. Elective course 3 – Engine Mapping

Exam weight: 5 ECTS

Content

- Theoretical background on engine management systems
- The use of programmable engine management systems for the optimisation of engine output and emissions
- Construction of ECU test rig.

Learning objectives

Knowledge and understanding
The student will gain knowledge about:

- The input/output matrix of engine management systems
- The implications of retrofitting programmable ECUs and modifying existing ECUs
- How to use test facilities to ensure the correct adjustment of ECUs
- Key sensors for ECUs.

Skills
The student will get the skills to:

- Be able to guide a customer in the selection and application of programmable ECUs
- Produce a suitable wiring loom for a given application
- Point out relevant parameters to observe during ECU adjustments.

Competencies:
The student will learn to:

- Start the configuration of retrofitting ECUs while observing relevant legislation
- Select a suitable system to match the hardware configuration of a given vehicle
- Guide the customer in legislation issues (e.g. emission testing) in relation to retrofitting of engine ECUs.

The exam form and organisation
The exam is an oral exam based on a practical solution to the construction of a test rig which can test and verify various inputs and outputs of the FFJ ECU. The exam starts with a joint group presentation of the project followed by an examination of the individual student.

There can only be a max of 6 students in one group.

The duration of the examination is 15 min. in total per student, of which:
Group presentation:

- The group presents the test rig, 5 min./per student (i.e. 5 students equals 25 min. presentation)

Individual examination of the student:

- Questions, 5 min.
- Assessment, 5 min.

The students are awarded an individual overall mark based on an overall assessment. The assessment includes the group presentation as well as the students' individual oral performance. The practical solution is only a prerequisite to take the exam.

Formal requirements

The test rig deals with practical work in designing a basic test setup and carrying out the construction of wiring looms. Furthermore, the student will get the skills to program different automotive sensors which they implement in the test rig.
In order to construct the ECU test-rig the student will need to understand documentation for the provided ECU. Requirements for the ECU test rig according to Table 1 below.

Inputs
On/off Switch
Intake air temperature
Coolant temperature
RPM signal
Egas throttle body
Manifold air pressure
Air mass
Outputs
4 injectors, one includes BNC connection for scope, one includes OEM connector, all connected to an LED
4 Ignition coil LEDs
A minimum of 2 relay outputs e.g. main relay and fuel pump relay
Egas
OBD connector and output

Table 1

The above requirements are mandatory and the minimum requirement for fulfilling the assignment.

The teachers are available for guidance during study time, and it is a requirement that the students work with the assignment in their study time.

Prerequisites to take the exam
The following requirements must be met to take the oral exam:

The practical solution must:

- Meet all the formal requirements, see above
- Must be handed-in on time, in accordance with the exam schedule, which is available on Campus.

Time Placement
The exam is placed in the 3rd semester. Information about the time and place can be found on Campus.

3.4. Elective course 4 – Electrical System Components

Exam weight: 5 ECTS

Content

- In-depth examination of the components used in automotive applications
- Measuring principles applied
- Method for troubleshooting components and systems.

Learning objectives

Knowledge and understanding
The student will gain knowledge about:

- The mechanical and electrical design of complex components
- The control of electrical components
- The concept of engine management in various combustion engine concepts.

Skills
The student will get the skills to:

- Design and upgrade MPI fuel systems
- Troubleshoot measuring components
- Acquire manufacturer-specific information to aid in fault finding.

Competencies:
The student will learn to:

- Approach electrical system troubleshooting systematically and with an understanding of each component.

The exam form and organisation
The exam is an individual written exam.
Duration: 120 min.

Access to all learning materials is allowed which means books, notes, PowerPoints from lessons, assignments and quizzes from Campus.
However no internet or hotspots are allowed.

Time Placement
The exam is placed in the 3rd semester. Information about the time and place can be found on Campus.

3.5. Elective course 5 – Indicating Components

Exam weight: 5 ECTS

Content
- Measurement techniques and test preparation
- Mathematical calculations on combustion cycles and thermodynamics
- Combustion measurement equipment and software
- Testing on the roller testbed adapted with an indicating system
- Data analysis.

Learning objectives

Knowledge and understanding
The student will gain knowledge about:
- Testing and development tool combustion measurements called *indicating*
- Different pressure sensor types and amplifiers for testing and used in modern production vehicles
- Calibration and thresholds and zero level
- Engine knock and noise
- Post processing data and signal filtering
- Preparing a measurement supported by a roller testbed
- Thermodynamics for the internal combustion engine and how it effects the measurement system and components
- Combustion measurement as trouble shooting equipment e.g. Emissions, durability and power
- Combustion effects due to alternative fuels and inherent engine optimisation
- The boundaries in engine optimisation in the case that combustion measurements are not applied.

Skills
The student will get the skills to:
- Select the correct sensor type and auxiliary equipment for a combustion measurement depending on the requirement for the output of the measurements
- Account for measurement uncertainty
- Set up the measurement chain with inductor calculations for accuracy
- Perform troubleshooting on potential engine seizure through combustion measurements

- Detect emission and after-treatment system issues/problems through combustion measurements
- Perform data logging on sensors and actuators such as crank signal, injection signal and ignition.

Competencies:
The student will learn to:

- Assist development projects within the field of engine optimisation
- Analyse data from the combustion measurement and provide suggestions for improvement in relation to emissions, durability and power
- Outline how to machine the pressure sensor in the cylinder head
- Identify all components for a combustion measurement system being able to choose the right configuration for a specific task, with an analytic approach
- Prepare a complete vehicle test for combustion measurement, also in conjunction with a roller testbed
- Carry out basic power, flow and efficiency calculations in relation to setting up the measurement
- Communicate the results from the practical engine testing in non-technical language through reporting and presentation
- Provide counselling for a client in relation to when and how a car should be adopted with indicating equipment and when it is not necessary.

The exam form and organisation
The exam is an individual oral exam.

The exam starts with the student answering a drawn question followed by an examination.

The duration of the examination is 15 min. in total, of which:

- The student answers the drawn question, 5 min.
- Questions, 5 min.
- Assessment, 5 min.

The exam is assessed according to the 7-point scale.

Time Placement
The exam is placed in the 3rd semester. Information about the time and place can be found on Campus.