Offered by
ICT Engineering

IT-EOS1

1.0

Embedded Operating Systems

ECTS
5

Prerequisites
Basic understanding of Programming, computer architecture and electronics. Practical experience with computer networking is an advantage.

- IT-CAL1
- IT-ELE1
- IT-SDJ1

Main purpose
Demands for computing power in embedded systems are increasing. At the same time, a shorter development time is required to be competitive. This calls for a way to reuse off-the-shelf components in a quick and easy way to build advanced applications. In this course, students will learn to use powerful open source components to build advanced embedded systems.

Knowledge
Having completed this course, students should have understanding of:

- Advantages and disadvantages of Linux as operating system in embedded systems.
- I/O structure in Linux.
- Electronic interfaces for digital and analogue signals

Skills

- Use basic features of Linux
- Configure the operating system and utilities to tailor the system's needs
- Write C/C++ programs to control sensors and actuators
- Cross-compile programs to run in an embedded system.

Competences
Having completed this course, students should be able to:

- Determine which kind of embedded systems the Linux operating system is suitable for
- Identify tools needed for developing embedded systems
- Interface sensors and actuators in software as well as hardware
- Configure communication between development- and target system
- Control the target system, using Linux commands and utilities
- Build simple Linux based embedded systems.

Topics
Embedded Linux. 32-bit Microcontrollers. Teamwork and project management.

Teaching methods and study activities
Estimated workload is approximately 137 hours.
Mix between theory and practical exercises. Students will work in groups on developing a simple embedded system based on a 32-bit hardware platform with Linux as operating system.

Each group must deposit 300 DKK for loan of necessary equipment.

Resources
Derek Molloy: Exploring BeagleBone – Tools and Techniques for Building with Embedded Linux. BeagleBone Black circuit board.

Evaluation
Internal examination.
The evaluation of the course is based on mandatory course work (50%) and the oral exam (50%) at the end of the course. Only students with approved course work will be allowed to attend the exam.

Examination
The exam is oral and it takes 20 minutes per student. The exam is in two parts. First part is a presentation and discussion of selected parts of the course work. Second part is drawn question from the theory of the course.

Grading criteria
Grading:

Grading is according to the 7-point grading scale.

Mark 12: Awarded to students who have shown excellent comprehension of the above-mentioned competences. A few minor errors and shortfalls are acceptable.

Mark 02: Awarded to students for the just acceptable level of comprehension of the required competences.

Additional information

Responsible
Erland Ketil Larsen

Valid from
1.2.2016

Course type
ICT Engineering;6. semester;Compulsory for the specialization Embedded Engineering;Electives;

Offered by
ICT Engineering

IT-SMP1

1.0

Stochastic Modelling and Processing

ECTS
5

Prerequisites
Upper level mathematics equivalent to A-levels. Calculus.

Main purpose
The ubiquitous presence of uncertainty and noise in the engineering sciences makes it mandatory to understand and quantify random phenomena. To achieve this goal the course will provide a solid introduction to the theory of stochastic processes. Special attention is given to applications and the student will model and analyse complex stochastic situations as encountered in practice. The applications include examples from various engineering fields such as information technologies and communications, signal processing, and more.

Knowledge
After successfully completing the course, the student will have gained knowledge about:

- The main working tools and concepts of stochastic modelling
- Probability theory and distributions
- Inferential statistics

Skills
After successfully completing the course, the student will be able to:

- Apply results from basic probability theory including conditional probability
- Use probability density and distributions functions of one and two variables
- Account for random variables and random processes
- Account for the processing of random signals in linear systems
- Calculate and interpret auto- and cross-correlation functions for random signals
- Calculate and interpret power density spectra and coherence functions
- Calculates and estimate errors and uncertainties.

Competences
After successfully completing the course, the student will have acquired competencies in:

- Planning experiments and state hypothesis
- Presenting statistical results from experiments
- Modelling experimental data with regression
- Analysing experimental results and test hypotheses.

Topics

- Experiments and the concepts of probability
- Calculations of probability
- Often encountered probability density and distribution functions
- Random variables and random processes
- Auto- and cross-correlation functions and correlation coefficients
- Power density spectra and coherence functions
- Analysis of errors in experiments
- Design of statistical experiments
- Creating hypotheses and confidence intervals
- Presentation of statistical data
- Linear and exponential regression
- Analysis of variance

Teaching methods and study activities
Approximately 150 hours. The course is a mixture of lectures, problem solving and computer/laboratory exercises with approximately 1/3 of the time devoted to each part.

Study Activity Model

Resources
Montgomery, D.C. & Runger, G.C. *Applied Statistics and Probability for Engineers*, 4th edition Wiley (obtained from library)
Cooper, G.R. & McGillem, C.D. *Probabilistic Methods of Signal and System Analysis*, 3rd edition. Oxford University Press (electronic version will be made available).

Evaluation
Grading will be done according to the 7-scale, using an internal examiner.

Examination

The final exam is a 3 hour written exam and takes place at Campus Horsens. Supplementary materials and aids are allowed. All supplementary materials and aids are allowed, e.g. using a computer as a reference work. Communication of any sort is not allowed during the exam and will lead to expulsion of all involved parties from the exam.

Grading criteria
According to the 7-point grading scale, interrnal examiner.

Mark 12:
Awarded to students who have shown excellent comprehension of the above-mentioned competences. A few minor errors and shortfalls are acceptable.

Mark 02:
Awarded to students for the just acceptable level of comprehension of the required competences.

Additional information
For more information, please contact Richard Brooks (rib@via.dk)

Responsible
Richard Brooks

Valid from
1.8.2016

Course type
ICT Engineering;6. semester;7. semester;Electives;

Offered by
ICT Engineering

IT-BPR2

1.0

Bachelor Project 2

ECTS
20

Prerequisites
BPR1, general conditions for ECTS credits.

- BPR1

Main purpose
The purpose of the Bachelor Project 2 is to evolve the student's ability to solve a relevant ICT Engineering problem and document the solution. In a group, students must be able to analyse, design, implement and test complex problems and be able to carry out well-documented and tested solutions.

Knowledge
After having completed this course, the students must master the knowledge about:

- Searching and scoping relevant project information
- Project and team work planning
- Communication and documentation skills
- Testing

Skills
After having completed this course, the student must master to:

- Identify and justify problems and their context
- Select and argue for choice of method and reflect critical and said methods
- Find and assess relevant literature within the problem domain
- Present the result for an audience of engineers

Competences
After having completed this course, the students must be able to:

- Describe and delimit a large ICT Engineering Project
- Select and use relevant theories and methods to solve the problem
- Plan and structure the project within the BPR2 time frame
- Initiate the preliminary steps in a system development process, leading to a clearly defined requirements capture, use cases as well as object and behavior analysis.
- Work successfully in a project group with the objective of solving a well-defined engineering problem.

Topics
The Bachelor Project (BPR2) is based on an ICT Engineering problem with a project description made in the BPR1 course.
The BPR2 project must contain:

- Data collection
- Brainstorm techniques
- Project methods
- Reference/citation model and literature search
- Document version control
- Requirements: How can you test the requirements, which test results do you expect for each test case.
- Analysis: Risk analysis (technology challenges, error implementations, Data loss, delays in order fulfillments), Actor/persona description, Use cases
- Design: System architecture, Class diagram, Layer model, Mockup model, Usability, GUI, Exceptions
- Implementation: Coding of project
- Test: Unit test, Integration test, System test, GUI test
- Automatic build servers – including automated tests
- Project results
- Evaluation/discussion of project results

- Time schedule and milestones
- Work flow management
- Group dynamics
- Report writing
- Presentation techniques

Teaching methods and study activities
Supervision, theory and independent work, project documentation and presentation.

Resources
To be announced on Studynet.

Evaluation
External examination.
The basis of the evaluation is the reports, the solution of the ICT Engineering problem, and the oral examination. The student's ability to express oneself (in writing and orally) and to spell is part of the evaluation.

Examination
Oral examination.
Group presentation of the project (20 minutes). Individual examination of each member of the group (20 minutes).

The individual examination typically starts from topics in the report and may involve all the topics from 1st to 7th semester.

Grading criteria
Grades are given according to the ECTS scale.

12: For an excellent performance displaying a high level of command of all aspects of the relevant material, with no or only a few minor weaknesses.

10: For a very good performance displaying a high level of command of most aspects of the relevant material, with only minor weaknesses.

7: For a good performance displaying good command of the relevant material but also some weaknesses.
4: For a fair performance displaying some command of the relevant material but also some major weaknesses.
02: For a performance meeting only the minimum requirements for acceptance.
00: For a performance which does not meet the minimum requirements for acceptance.

-3: For a performance which is unacceptable in all respects.

If a project is assessed as "failed" (00 or -3), a written justification for the assessment is worked out by the supervisor and the external examiner.

Additional information
The Project Report must have the following extent: 20-30 pages per student plus appendices.

Responsible
Poul Væggemose

Valid from
2.2.2017

Course type
ICT Engineering;Compulsory Course for all ICT Engineering;Project;7. semester;Compulsory for the specialization Business Information Systems;Compulsory for the specialization Cross Media;Compulsory for the specialization Embedded Engineering;