Learning outcomes: (from course syllabus)
On completion of the course, the student should be able to:
- apply model based construction and analysis of embedded systems, especially the software.
- use current techniques and tools, e.g. Simulink and MATLAB to develop embedded software.
- work in teams through the entire development cycle, from system specification to constructing a prototype and system implementation.
Course contents:

- Model Based Development: general
- Review of MATLAB
- Simulink: modeling, simulation,
- Modeling continuous physical systems: Differential equations,
- (in some years) Design of controllers using MATLAB/Simulink
- State machines and Stateflow
- Code generation and deployment
- Formulation of requirements
- Systematic simulation and testing
- Semantics of different block-structured modeling languages
- Using the above in design of embedded systems
(appr.) 4 assignments, solved individually,
One mini-project: Modeling, Simulation, Code Generation, Deployment of Elevator System, done in pairs,
No written exam
Grade based on all of these:
- Each assignment gives 100p, the project gives 160p/participant.
- Grades are appr. 3: 55%  4: 70%  5: 85%
- Each problem must be solved at level of grade 3
Assignments **must** be handed in on time. Late assignments can only reach grade 3.
Feedback will be given within 3-4 working days
Look at feedback: Some later assignments and project use material from earlier assignments
Course Information:

- **Material**: Lecture slides, exercises, assignments, and the like, are found on StudentPortalen.

- **Schedule**: with topics and pointers to material and exercises for each lecture is maintained at the following **Schedule page**: http://www.it.uu.se/edu/course/homepage/modbasutv/ht20

  The schedule page is updated continuously, and maintains information about topic of (next) lecture(s), relevant material, deadlines, etc.
Tools

**Tool:** For the Course, you **must** install and use MatLab/Simulink, Install the latest release R2020a. Do **not** upgrade to R2020b when it arrives: versions are not compatible (so we cannot grade assignments)

Freely available for students, for Windows, MAC, Linux, See http://www.uu.se/goto/matlab/

You should include at least the following toolboxes: Simulink, Stateflow, Control System Toolbox, Embedded Coder, Simulink Coder, Simulink Control Design, Simulink Design Verifier

You must also install a supported C/C++-compiler (see documentation).

If you need assistance with installation, please contact us

In these time, you more or less must use your own laptop (Matlab/Simulink is also installed in PC labs)
Lecture slides, Collections of exercises, and Additional reading material, are posted in Studentportalen and referenced on the Schedule page.

Additional reading material includes User Guides and Documentation, such as:

- etc. **Do not print them!!** (paper waste)

Mathworks has rich online documentation

There are many Collections of Examples on Internet, e.g.,

- http://se.mathworks.com/help/simulink/examples.html (Mathworks collection)
- Note: not all examples are well-designed!
Who are we:

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Rhythm of Course

- Each week: 3 lecture sessions, 2 exercise sessions
- Every two weeks: Assignment/lab
- Some assignments split into two w. different deadlines for quicker feedback
- Assignments **must** be handed in on time (we are on a tight schedule).
- Feedback will be given within 4 days
- Project started in week 39/40 (builds on previous assignments)
- You **must** complete assignment 2 before starting project
Sequence of topics for Lectures:

- **week 36:**
  - Model Based Development: general (today)
  - Review of/Intro to MATLAB:
  - Introduction to Simulink

- **week 37:**
  - System modeling in Simulink (mainly continuous)
  - Simulink semantics and simulator
  - Structuring Simulink models
  - **Assignment 1** due

- **week 38:**
  - State Machines
  - Stateflow
  - Stateflow Idioms
Sequence of topics for Lectures (ctd):

- **week 39:**
  - Hybrid systems
  - Hybrid systems
  - Animation of Simulink models
  - **Assignment 2** due

- **week 40:**
  - Code generation
  - Code generation: S-Functions
  - Code generation: Driver generation
  - Start of **Project**

- **week 41:**
  - Verification for Simulink/Stateflow models
  - Formulating requirements
  - Testing by simulation of models
  - **Assignment 3** due
Sequence of topics for Lectures (ctd):

- **week 42:**
  - Problematic features for Simulink/Stateflow
  - Other modeling formalisms: Modelica
  - Lustre (two lectures)

- **week 43:**
  - Lustre (ctd.)
  - Modelica
  - **Assignment 4 due**

- **week 44:**
  - Final week
  - Project demonstrations/presentations
What to do til next meeting:

- Install MATLAB/Simulink R2020a on your laptop
  - include at least the following toolboxes:
    Simulink, Stateflow, Control System Toolbox, Embedded Coder, Simulink Coder, Simulink Control Design, Simulink Design Verifier
  - Ping us if there are problems

- Get familiar with (brush off your knowledge of) MATLAB, by
  - studying (at least) Matlab: Primer
  - Looking at the topics of slides matlab1.pdf
  - Solving exercises in matlab-exercises.pdf