Critical Embedded System

introduction, course requirements

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Fault Tolerant Systems Research Group

- Department of Measurement and Information Systems
  - Approx. 70 employees, 35 PhD students
  - Embedded Systems
  - Intelligent Systems
  - **Fault Tolerant Systems (FTSRG)- 21 person**
- Software engineer, electrical engineer, medical engineer
- Basic courses (software engineering)
  - Digital systems
  - Operating systems
  - Artificial intelligence
  - Embedded systems
  - Formal methods
  - Measurement laboratory
- Specialization (software engineering)
  - Integrated intelligent systems (BSc)
  - Systems design (BSc)

Education by the Research Group (FTSRG)

- Formal methods
- Specialization in system design (BSc)
  - Intelligent System Monitoring
  - System modeling
- Specialisation in dependable system design (MSc)
  - Design for dependability
  - Model-driven software development
  - Service integration
  - Autonomic and fault tolerant computing systems
  - Software verification techniques

Research

- Model-based system design
  - EMF-IncQuery framework
  - Transformation technologies
  - Automated system development
- Embedded systems
  - Modeling
  - Automated development
  - Verification
  - Testing
- System management
  - Virtualized environments
  - Automated intervention
- Designing dependable systems
- Service-oriented architectures

Relevant research projects

- Embedded systems
  - DECOS
  - Genesys
  - Mogentes
- Mobile, distributed systems
  - HIDENETS
- Model-based SOA
  - SENSORIA
- Dependable systems
  - RESIST
  - Amber
  - SafeDMI (railroad)
  - DIANA (avionics)
  - CECRIS
- System management
  - DESEREC
- Model based Development
  - MONDO

Critical Embedded Systems course

- Aims
  - Dependability is a critical aspect for the design of safety critical embedded systems (avionics, automotive, medical, etc.) where a system failure may result in severe losses or casualties. The course aims to overview the main development, verification and validation principles and technologies of critical embedded systems.

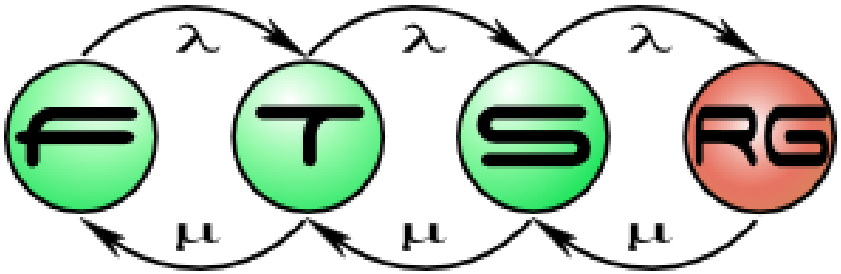
- Students completing the course requirements successfully will:
  - gain proficiency in the basics of safety and related issues
  - be able to understand **safety requirements** against critical systems, **model** their operation environment and **architecture**.
  - become familiar to the basics of **model-based architecture** design,
  - get to know the **certification standards** in the safety-critical embedded domain

Course Structure

- Basics of safety
  - Definition of safety
  - Verification and Validation techniques
    - Testing
    - Formal methods
    - Hazard Analysis
- Model-based desing in safety-critical systems
  - Requirement modeling
  - Structural modeling
  - Behavior modeling
- Case-studies
  - Nuclear
  - Avionics
  - train

Contact

- Homepage
  - Course material
  - https://www.inf.mit.bme.hu/en/edu/courses/critembed
- Class: IL 405
  - Officially: Wednesday, 16:15-18:00
    - → Moved to Tuesday 8:15-10:00
  - Friday, 8:15-10:00
  - Please arrive on time!



Lecturers

- Dr. Ákos Horváth
  - Office hours:
    - 16:30-18:00, Monday
  - ahorvath@mit.bme.hu
- Dr. Balázs Polgár
- Dr. Zoltán Micskei
- András Vörös
- Benedek Izsó

Course information

- Requirements
  - Homework
    - Formal modeling: 7th week
    - Modeling and requirements: 10th week
    - Submission: End of 13th week
  - Hw defense and Oral exam – 13th of December
    - Defend your own work, questions about hows and whys!
      - HW is a significant part of the grade
    - Handout course material and everything you hear at class!

- Extra assigment for additional points
  - Presentation of selected scientific paper
  - Additional formal modeling
  - Complete case-study implementation
  - Etc.

Homework

- Two hand-ins
  - Formal modeling
  - Model-based design of critical system
    - Requirements modeling based on written specification
    - Structural models
    - Behavior models
  - Documentation

- Oral defense on the last week with an oral exam