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South East Technological University

Module Descriptor

Model-Based Development (Computing and Mathematics)

Model-Based Development (A13822)

Short Title: Model-Based Development
Department: Computing and Mathematics
Credits: 5 **Level:** Intermediate

Description of Module / Aims

This laboratory-based module provides a comprehensive study of model-based design and development for dynamic, embedded control systems. Industry-standard interactive model-based development tools are used to model, simulate, implement, and test a variety of time-varying systems. A number of case studies related to intelligent automotive control are examined.

Programmes

		stage/semester/status
COMP-0433	BSc (Hons) in Applied Computing (WD_KACCM_B)	3 / 5 / E
COMP-0433	BSc (Hons) in Applied Computing (WD_KCOMP_B)	3 / 5 / E
COMP-0433	BSc (Hons) in Computer Science (WD_KCMSC_B)	3 / 5 / E

Indicative Content

- Model definition for dynamic control systems
- Model in the Loop
- Software in the Loop
- Hardware in the Loop
- Rapid Control Prototyping
- Apply model-based construction and analysis of embedded software systems

Learning Outcomes

On successful completion of this module, a student will be able to:

1. Construct mathematical models for plant and controller systems.
2. Design and apply Model in the Loop(MIL), Software in the Loop(SIL) and Hardware in the Loop(HIL) simulations.
3. Apply and simulate suitable feedback-based control algorithms using current tools and techniques.
4. Produce code to target a specific microcontroller platform.
5. Apply the model-based development paradigm for continuous model refinement and re-verification.
6. Analyse embedded model designs and simulation results.

Learning and Teaching Methods

- Combination of lectures and laboratory-based practical exercises.
- Lectures will cover theoretical basis of key topics in model based design: Model definition; feedback systems; ECU targeting and code generation.
- Laboratory-based practicals will combine topics covered in lectures to build, simulate and deploy embedded software solutions using the model-based development approach.

Learning Modes

Learning Type	F/T Hours	P/T Hours
Lecture	12	
Practical	36	
Independent Learning	87	

Assessment Methods

	Weighting	Outcomes Assessed
Continuous Assessment	100%	
Assignment	40%	1,2,3
Assignment	60%	3,4,5,6

Assessment Criteria

<40%: Unable to define an abstract model for a specified system. Unable to use modelling tools.

40%–49%: Define, model and simulate basic embedded solution. The work carried out required a high level of supervision.

50%–59%: In addition to above, analyse specialised systems. Interpret simulation test results and update model accordingly. Present results adequately.

60%–69%: In addition to above, has a high level of experimental skills and has shown the ability to produce clear and logical analysis of assessment work.

70%–100%: All the previous to an excellent level. Can critically assess any experimental work undertaken. Combine self-directed research of state-of-the-art model-based design systems in assessment work.

Supplementary Material(s)

- "Model-Based Design." http://uk.mathworks.com/solutions/model-based-design/

Requested Resources

- Room Type: Computer Lab