ES3J1-15 Advanced Systems and Software Engineering

24/25

Department
School of Engineering
Level
Undergraduate Level 3
Module leader
Mathias Foo
Credit value
15
Module duration
20 weeks
Assessment
100% coursework
Study location
University of Warwick main campus, Coventry

Description

Introductory description

The aim of this module is to equip students with the practical and theoretical knowledge to develop a complex system within industry, and ensure that systems engineering graduates are equipped with marketable skills.

Module aims

The main aim of this module is to equip students with the practical and theoretical knowledge to develop a complex system within industry. This includes: the use of open-source development tools and libraries (i.e. python); deriving data-driven dynamic models of a system (i.e. using system identification); and implementing a real-time control system.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Software development in python (or other suitable language):

- functions/classes
- development of GUIs
- application of machine learning and system analysis techniques

System identification and state-estimation techniques:

- Frequency-domain techniques
- ARX
- State-space
- Kalman filtering

System development:

- Real-time implementation of control algorithms
- Testing of control systems
- Sensors and instrumentation
- Quality approaches
- Team working skills

Learning outcomes

By the end of the module, students should be able to:

- Apply system and software engineering principles to develop a complex system
- Apply data-driven techniques to estimate dynamic system models
- Work effectively in a team and self-reflect upon personal strengths and areas for further development
- Integrate knowledge and skills from various domains in order to develop a complex system

Indicative reading list

Svein Linge, Hans Petter Langtangen, Programming for Computations - Python, SpringerOpen, 2nd edition, 2020.

View reading list on Talis Aspire

Subject specific skills

Ability to apply relevant practical and laboratory skills
Ability to be pragmatic, taking a systematic approach and the logical and practical steps necessary for, often complex, concepts to become reality

Transferable skills

1. Numeracy: apply mathematical and computational methods to communicate parameters, model and optimize solutions
2. Apply problem solving skills, information retrieval, and the effective use of general IT facilities

3. Communicate (written and oral; to technical and non-technical audiences) and work with others
4. Appreciation of the global dimensions of engineering, commerce and communication
5. Be professional in their outlook, be capable of team working, be effective communicators, and be able to exercise responsibility and sound management approaches.

Study

Study time

Type	Required
Lectures	12 sessions of 1 hour (8%)
Practical classes	11 sessions of 2 hours (15%)
Private study	116 hours (77%)
Total	150 hours

Private study description

Carrying out lab activities, work on group project.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A1

	Weighting	Study time	Eligible for self-certification
Python Assessment Submit python code	50%		Yes (extension)
Group Project	50%		No

Systems group project including self-reflection on team working skills, presentation (10mins) and group report (3000 words) + peer review

Feedback on assessment

individual feedback on all assignments, cohort feedback on all assignments, verbal feedback during labs and drop-in sessions.

Availability

Pre-requisites

To take this module, you must have passed:

- All of
  - ES2D7-15 Systems and Software Engineering Principles

Courses

This module is Core optional for:

- Year 3 of UESA-H115 MEng Engineering with Intercalated Year
- Year 3 of UESA-H11L Undergradaute Engineering (with Intercalated Year)

This module is Optional for:

- Year 3 of UESA-H113 BEng Engineering
- Year 3 of UESA-H114 MEng Engineering
- Year 4 of UESA-H115 MEng Engineering with Intercalated Year
- Year 4 of UESA-HH32 MEng Systems Engineering with Intercalated Year
- UESA-H11L Undergradaute Engineering (with Intercalated Year)
  - Year 3 of H11L Engineering (with Intercalated Year)
  - Year 4 of H11L Engineering (with Intercalated Year)

This module is Option list A for:

- Year 4 of UESA-H111 BEng Engineering with Intercalated Year
- Year 3 of UESA-HH35 BEng Systems Engineering
- Year 4 of UESA-HH34 BEng Systems Engineering with Intercalated Year
- Year 3 of UESA-H112 BSc Engineering
- UESA-HH31 MEng Systems Engineering
  - Year 3 of HH31 Systems Engineering
  - Year 3 of HH35 Systems Engineering
- Year 4 of UESA-HH32 MEng Systems Engineering with Intercalated Year