CS143-15 Logic and Automata

25/26

Department
Computer Science
Level
Undergraduate Level 1
Module leader
Ramanujan Maadapuzhi Sridharan
Credit value
15
Module duration
10 weeks
Assessment
Multiple
Study location
University of Warwick main campus, Coventry

Description

Introductory description

This module introduces students to formal methods for describing and analysing the behaviour of computational systems.

Module aims

To introduce students to basic connections between mathematical logic, formal languages, automata theory and verification by model checking. Students will also learn and practise proof techniques for reasoning about the limits of various computational models, including concepts such as the pumping lemma and diagonalisation.

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.

Propositional logic and predicate logic, proofs, semantics, regular languages, finite automata, non-determinism, regular expressions, pumping lemma, closure properties, Turing-recognisable languages, Turing machines, decidability, reducibility.

Learning outcomes

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

- Construct and reason about proofs in a variety of logics.
- Apply logic to specify and verify computing systems.
- Specify formal languages and translate between various forms of formal language descriptions.
- Argue that given formal languages are (or are not) regular.
- Understand basic connections between expressive power of some logics and computational models.

Indicative reading list

(a) W. Thomas. Languages, Automata and Logic, Handbook of Formal Languages, volume 3, Springer-Verlag, 1997.
(b) M. Sipser, Introduction to the theory of computation, Cengage Learning, 2013.
(c) J. E. Hopcroft; R. Motwani; J. D. Ullman, Introduction to automata theory, languages, and computation, Pearson, 2014.
(d) B. Khoussainov and A. Nerode, Automata Theory and its Applications. Progress in Computer Science and Applied Logic, Volume 21. Birkhauser, 2001.
(e) M. Fitting, First-order logic and automated theorem proving, Springer-Verlag, 1996.

Subject specific skills

1. Formal reasoning about computer systems, languages and proofs. Theory and practice relating to reliability of systems form a vital part of computer science.
2. Formally describing, reasoning about and comparing various computational models. Applied in the study of complexity of computational problems.

Transferable skills

Critical Thinking, problem-solving, ability to define problems, design solutions and conduct mathematically rigorous analysis of possible solutions .

Study

Study time

Type	Required
Lectures	30 sessions of 1 hour (20%)
Total	150 hours

Type	Required
Seminars	9 sessions of 1 hour (6%)
Private study	109 hours (73%)
Assessment	2 hours (1%)
Total	150 hours

Private study description

Inclusive of preparation for seminars, background reading, coursework assignment and revision.

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group D

	Weighting	Study time	Eligible for self-certification
Programming Assignment Programming Assignment	20%		Yes (extension)

This assessment is eligible for self-certification (extension).

	Weighting	Study time	Eligible for self-certification
In-person Examination Final Examination (written)	80%	2 hours	No

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- Answerbook Pink (12 page)

Assessment group R

	Weighting	Study time	Eligible for self-certification
In-person Examination - Resit Resit Examination	100%		No

- Answerbook Pink (12 page)

Feedback on assessment

Marks, feedback on Tabula.

[Past exam papers for CS143](#)

Availability

Courses

This module is Core for:

- UCSA-G500 Undergraduate Computer Science
  - Year 1 of G500 Computer Science
  - Year 1 of G500 Computer Science
  - Year 1 of G500 Computer Science
- UCSA-G503 Undergraduate Computer Science MEng
  - Year 1 of G500 Computer Science
  - Year 1 of G500 Computer Science
  - Year 1 of G503 Computer Science MEng
  - Year 1 of G503 Computer Science MEng
- Year 1 of UCSA-I1N1 Undergraduate Computer Science with Business Studies