CS917-15 Foundations of Computing

22/23

Department
Computer Science
Level
Taught Postgraduate Level
Module leader
Feng Hao
Credit value
15
Module duration
10 weeks
Assessment
Multiple
Study location
University of Warwick main campus, Coventry

Description

Introductory description

The aim of the module is to equip students with a grounding in foundations of computing, to enable students from a wider background to confidently undertake a taught masters programme in advanced computing topics.

Module aims

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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.

-Computational Mathematics and Statistical Methods (logic, sets, probability and hypothesis testing)

-Programming and Data Structures (procedural and object oriented programming, using appropriate data structures)

-Algorithms and Complexity (analysis of algorithms, searching and sorting algorithms and calculation best, worst and average case complexities)

Learning outcomes

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

- Understand the foundational concepts of computing mathematics and statistical methods.
- Write computer programs with an understanding of type systems and control flow in both procedural and object oriented programming paradigms and have strategies for debugging. Use data structures such as arrays, lists stack, queues, hash tables and trees effectively.
- Understand the relationships between algorithms and complexity.

Indicative reading list

Huth and Ryan, Logic in Computer Science
Daniel Liang Y, Introduction to Java Programming - Comprehensive (7th ed), Pearson, 2008.
Goodrich MT, Tamassia R and Goldwasser MH, Data Structures and Algorithms in Java (6/e), Wiley, 2015.
Kleinberg J and Tardos E, Algorithm Design, Addison Wesley, 2005.

Subject specific skills

Computing Mathematics and Statistical Methods
Computing Mathematics: Logical analysis; Propositional Logic; Sets and Relations; Predicate Logic
Statistical Methods: Probability; Distributions; Significance Tests; Confidence Intervals; Hypothesis Testing
Programming and Data Structures
Programming: Procedural and Object Oriented
Programming; Type Systems; Control Flow; Debugging
Data Structures: Arrays, Lists, Stacks and Queues; Hash
Tables; Trees

Algorithms and Complexity
Algorithms: Basics of Algorithm Analysis; Sorting and
Searching; Graph Algorithms
Complexity: Best, Worst and Average Case Complexity;
Applications of the Master Theorem; Problem Instances

Computing Architectures
Processors and Memory Hierarchies; Client Server; Models of Distributed Systems; Application Domains
-Computing Grand Challenges
-Big Data; Internet of Things; Privacy; Quantum Computing; New Approaches in AI; Smart Cities

Transferable skills

Ability to program in Python, to design and analyse efficient computing algorithms, to apply logical analysis as well as probability and statistical tools to computationally address mathematics and statistics problems.

Study

Study time

Type	Required
Lectures	30 sessions of 1 hour (20%)
Seminars	20 sessions of 1 hour (13%)
Private study	100 hours (67%)
Total	150 hours

Private study description

Private study, background reading 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.

Students can register for this module without taking any assessment.

Assessment group A3

	Weighting	Study time
Programming assignment	34%	

Programming assignment. This assignment is worth more than 3 CATS and is not, therefore, eligible for self-certification.

Algorithms assignment	33%	

Algorithms assignment. This assignment is worth more than 3 CATS and is not, therefore, eligible for self-certification.

Maths and Statistics assignment.	33%	

Maths and Statistics assignment. This assignment is worth more than 3 CATS and is not,

	Weighting	Study time

therefore, eligible for self-certification.

Assessment group R

	Weighting	Study time
Combined assignment	100%	

Combined assignment. This assignment is worth more than 3 CATS and is not, therefore, eligible for self-certification.

Feedback on assessment

Individual feedback on each assignment.

Availability

Courses

This module is Core for:

- Year 1 of TPSS-C803 Postgraduate Taught Behavioural and Data Science
- TCSA-G5PD Postgraduate Taught Computer Science
  - Year 1 of G5PD Computer Science
  - Year 1 of G5PD Computer Science
- Year 1 of TCSA-G5PA Postgraduate Taught Data Analytics