

# 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

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## 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.

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## 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.

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## 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.

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## 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