# Solent University Module Descriptor

## **Module Code: COM421 Module title: Data Structures, Algorithms and Mathematics**

### **Why is this module important**?

It is often the case when writing software that you will need to instruct your program to perform a series of steps in order to solve a complex task or calculate the answer to a complex problem. This series of instructions is known as an algorithm and it essentially tells the program how to solve a problem.
The nature of programming means that there are many ways to go about solving a single problem, but thought should also be given to optimisation – solving the task as fast as possible whilst minimising the resources that need to be allocated.

Algorithms are part of the life of a programmer and thus this module will aim to ensure that you are comfortable writing them, as well as being made aware of existing algorithms that are frequently used.

Programmers need to be aware of data structures and mathematical principles that underpin the algorithms they write. This will help improve your understanding of what is happening, improve your overall problem-solving capabilities and help you to be a more effective programmer.



Traveling salesman problem (xkcd).

### **What you will learn on the module?**

You will gain hands on experience applying a range of algorithms and data structures to problems. As well as creating your own algorithms, you will also be made aware of existing algorithms that are at your disposal and understand how they work.
You will also learn about numerous data structures that you can use, how they function and utilise them to solve problems.
In addition, you will develop your mathematical abilities as you learn about common mathematical concepts that underpin both the data structures and the algorithms that you use, as well as learning mathematical structures that are useful to programming and computing in general.
You will develop your problem-solving skills as you create your own algorithms or apply existing algorithms in order to solve the problems you are given.

### **How you will learn**

Each week, your first session will begin with a theoretical lecture that will explain the concepts you will need to know. The remainder of the week will be dedicated to hands on practical sessions in which you will have the opportunity to apply the concepts you have learnt from the lecture.

### **How much time the module requires**

For a 20 Credit module you are expected to study for 200 hours (which equates to 10 hours per credit.  This total learning time is made up of contact time, directed learning tasks, independent learning and assessment activity. Your tutor will offer you guidance on how you should best manage your study time on this module.

### **How you will be assessed**

#### **Tasks which help you to learn and prepares you for summative tasks (Formative):**

The weekly tasks and problems will be discussed, and formative support given. You are expected to reflect on this feedback and ensure that your understanding evolves to meet the learning outcomes.

#### **Tasks which count towards your degree (Summative):**

For the first assessment, your practical abilities will be demonstrated. You will be given a project in which you will be required to design algorithms that solve real-word problems. These problems will be provided to you as part of the assessment brief. You will need to utilise your knowledge on algorithms, data structures and the underpinning mathematical concepts to complete this assessment.

In the second assessment, you will present your solutions (from the first assessment) to the assessor. You will need to explain and evaluate your solution; this will include explaining why you took this approach over other possible solutions. You should also be prepared to answer questions designed to assess your understanding of algorithms, data and mathematical structures.

**When assessment does not go to plan**
Students will be able to submit their work at a later stage for resubmission and will be given additional support.

### **What you will be able to do after the module**

1. Understand and apply the computational maths required to be a software developer.
2. Distinguish between various algorithm problem solving strategies.
3. Problem-solve a range of real-world scenarios.
4. Discuss the classification of algorithms and mathematical computational problems.
5. Communicate findings using a variety of media.

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| Dimensions | How students learn | How students are assessed |
| Students are challenged to think in critical, creative and applied ways |  |  |
| Students experience an intellectually stimulating curriculum which inspires them to learn for life | Students will understand the importance of learning | Assignment engages them to apply computational mathematics |
| Students face outward to the community, industry and the global environment | Students will problem-solve a range of real-world scenarios. | Report engages the student to look at application of algorithms |
| Students learn from authentic, engaging and programmatic assessment | Students will critique their approach to the problems | Students will be assessed by presentation |

**Summative assessment details**

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| --- | --- | --- |
| AE1 | Weighting: | 70% |
|  | Assessment type: | Individual Report |
|  | Aggregation: | Aggregated to AE2 |
|  | Length/duration: | 2000 words |
|  | Online submission: | Yes |
|  | Grade marking: | Yes |
|  | Anonymous marking: | No |

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| --- | --- | --- |
| AE2 | Weighting: | 30%  |
|  | Assessment type: | Project Presentation plus notes |
|  | Aggregation: | Aggregated to AE1 |
|  | Length/duration: | 5 minutes per person plus 5 minutes questions |
|  | Online submission: | Yes |
|  | Grade marking: | Yes |
|  | Anonymous marking: | No |

### **Module Author:**

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| Module Title: Data Structures, Algorithms & Mathematics |
| Credit Points: | 20 | Module Code: | COM421 |
| FHEQ Level: | 4 | School/Service | SMAT |
| Module Delivery Model: | CD | Max/Min student numbers |  |
| Module Leader: | Darren Cunningham |
| HECOS code | 101029 |

### **Module change history:**

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| --- | --- | --- | --- |
| Module Approved/Year Implemented/Code | July 2019 | 2020/21 | COM421 |
| Module modified/Year Implemented/Code |  |  |  |
| Add extra rows as required |  |  |  |