

## Unit 108

# Software and information systems engineering

### Unit summary

This unit is about the techniques and practices involved in producing high-quality software systems.

### Aims

This unit aims to develop an understanding of software engineering.

### Prerequisites

Direct access to a computer, so that the student may complete the Learning Outcomes.

A practical working knowledge of one or more modern programming languages, such as Java, Ada, C++, C, etc.

A basic understanding of fundamental Computer Science topics which are used as the initial building blocks of Software Engineering, such as algorithms and data structures; computer architecture, discrete mathematics; operating systems; programming languages.

### Learning outcomes

There are **three** outcomes to this unit. The candidate will be able to:

- Assess the strengths and weaknesses of various software engineering processes
- Produce simple analyses, designs, implementations and test suites for small systems
- Elucidate and apply the principles behind the management and control of software production processes

### Guided learning hours

It is recommended that 300 hours should be allocated for this unit. 120 of those hours are actual taught hours. This may be on a full time or part time basis.

### Key Skills

This unit contributes towards the Key Skills in the following areas:

#### IT4.1

Develop a strategy for using IT skills over an extended period of time.

#### IT4.2

Monitor progress and adapt your strategy, as necessary, to achieve the quality of outcomes required in work involving the use of IT for **two** different, complex purposes.

#### IT4.3

Evaluate your overall strategy and present the outcomes from your work using at least **one** presentation, showing integration of text, images and number.

#### PS4.1

Develop a strategy for using skills in problem solving over an extended period of time.

PS4.2

Monitor progress and adapt your strategy, as necessary, to achieve the quality of outcomes required when tackling **one** complex problem with at least three options.

PS4.3

Evaluate your overall strategy and present the outcomes from your work using a variety of methods.

### **Occupational Standards**

This unit has been mapped to the following National Occupational Standards:

- 1.1.1 Identify the requirements of clients for engineering products or processes
- 1.1.2 Produce specifications for engineering products or processes
- 1.3.2 Evaluate the results of research
- 1.4.2 Develop a strategy for the design process
- 1.4.3 Create designs for engineering products or processes
- 1.4.4 Evaluate designs for engineering products or processes
- 2.1.2 Specify production methods and procedures to achieve production requirements
- 2.2.2 Solve production problems with engineering solutions
- 4.1.1 Determine the operational requirements of engineering products or processes
- 6.2.1 Assure the quality of engineering products or processes
- 8.1.1 Maintain and develop own engineering expertise

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### Outcome 1

Assess the strengths and weaknesses of various software engineering processes

#### Knowledge requirements

##### The candidate knows how to:

- 1 various software development process models in a variety of contexts such as:
  - a requirements uncertainty
  - b known application domain-specific issues
  - c risk management
  - d safety critical / dependable computing systems
- 2 software analysis and design modeling techniques
- 3 implications of software development paradigms for concerns such as:
  - a efficiency
  - b testability
  - c dependability
  - d maintainability
  - e reusability

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### **Outcome 2**

Produce simple analyses, designs, implementations and test suites for small systems

### **Knowledge requirements**

#### **The candidate knows how to:**

- 1 elicit software requirements, and construct specifications and system models
- 2 analyse and develop designs for small systems
- 3 apply design patterns
- 4 use various software development paradigms
- 5 implement and evolve software prototypes for small systems
- 6 test small systems

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### **Outcome 3**

Elucidate and apply the principles behind the management and control of software production processes

#### **Knowledge requirements**

##### **The candidate knows how to:**

- 1 identify the requirements for management of software projects with respect to:
  - a documentation
  - b quality assurance
  - c operation and maintenance
  - d tools (including CASE)
  - e measurement and metrics
  - f configuration management
- 2 identify when formal specification and verification techniques are appropriate
- 3 employ a variety of project management techniques appropriate for software development projects

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## Recommended reading list

<b>Title</b>	<b>Author(s)</b>	<b>Publisher</b>	<b>ISBN</b>
Software Engineering	Sommerville	Addison-Wesley.	020139815X
Software Engineering: A Practitioner's Approach (European Adaptation) (adapted by Darrel Ince)	Pressman	McGraw Hill	0077096770
or Software Engineering: A Practitioner's Approach	Pressman	McGraw Hill	007301933X
Software Engineering with C++ and CASE Tools	Pont	Addison-Wesley	020187718X
Unified Modeling Language User Guide	Booch, Rumbaugh, Jacobson	Addison-Wesley	0201571684