WM195-30 Smart Solutions Development (Programming)

26/27

Department
WMG
Level
Undergraduate Level 1
Module leader
Jianhua Yang
Credit value
30
Module duration
40 weeks
Assessment
100% coursework
Study locations
University of Warwick main campus, Coventry Primary
Distance or Online Delivery

Description

Introductory description

The Industry 4.0 revolution is transforming every sector, pushing industries to become smarter, more adaptable, and more connected. Smart and portable devices now display critical information via touchscreens, powered by software programs embedded in hardware systems. As a result, programming skills have become essential for developing reconfigurable, customized, and reliable software solutions. These skills not only enhance customer experiences but also enable industries to differentiate themselves in an increasingly competitive market. In this module, learners will also be introduced to self-directed learning and development, laying the foundation for lifelong learning and Continuous Professional Development (CPD).

This module contributes to AHEP 4 learning outcomes for Partial CEng and BCS accreditation criteria for Full CITP as referenced in the learning outcomes.

Module aims

This module will teach apprentices a range of digital technology solution development techniques and tools including programming concepts and basic algorithms using modern languages.

Apprentices will gain knowledge and hands-on experience in development, testing, implementation, and debugging, as well as problem-solving skills. They will gain a good understanding of code quality and coding standards.

Learners will be taught to manage their own professional development as engineers / IT professionals (as individuals, team members or leaders), by introducing them to reflective practice and the UK Standard for Professional Engineering Competence (UK SPEC) / Chartered IT Professional (CITP) standard.

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.

Variables and constants
Variable types and assignment
Local variables, global variables, variable scoping
Operators
Mathematical operators
Bitwise operators and logical operators
Loops and decision structures
For loops
While and do-while loop
If/else statements
Switch and case statements
Nested decision structures
Functions
Built-in functions
Passing arguments to functions and returning values
Recursive functions
Version control
Version management
Head, master, origin, branch
Professional competences

Learning outcomes

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

- Recall basic syntax, grammar, and algorithms used in modern programming languages, and associated development techniques and tools. [AHEP:4-C1,C3][BCS:2.1.1,2.1.2]
- Describe underlying theories of object-oriented programming, and how these are applied at different stages of software development. [AHEP:4-C5,C6][BCS:2.1.5,2.1.12]
- Discuss factors affecting software quality and approaches for how to control them including code quality and coding standards. [AHEP:4-C14][BCS:2.2.2]
- Apply the basic principles of coding, version control, testing and debugging software for data analysis involving different data formats. [AHEP:4-C14][BCS:2.2.4]
- Function effectively as an individual, and as a member or leader of a software development

team. [AHEP:4-C16,C17][BCS:2.3.1,2.3.2]
- Reflect on their own learning and experience in terms of developing Knowledge, Skills, Behaviours and Professional Engineering / IT Competences (as appropriate to their role), to set and monitor their own professional development goals. [AHEP:4-C18][BCS:2.1.13]

Indicative reading list

Specific reading list for the module

Subject specific skills

Contributes to the occupational standard for Digital and Technology Solutions Professional (ST0119):
Initiate, design, code, test and debug a software component for a digital and technology solution (S4).
Work effectively within teams, leading on appropriate digital technology solution activities (S7).
Initiate, design, implement and debug a data product for a digital and technology solution (S10).
Report effectively to colleagues and stakeholders using the appropriate language and style, to meet the needs of the audience concerned (S13).
Apply relevant legal, ethical, social and professional standards to a digital and technology solution (S15).

Transferable skills

Has the capabilities that enable living, learning and working in a digital society; Comfortable with using digital media to communicate, solve problems, manage information, collaborate, create and share content.
Use rational and logical reasoning to deduce appropriate and well-reasoned conclusions.
Operate within, and contribute to, a respectful, supportive and cooperative group climate; Sensitive to the impact of action on others.
Actively seek opportunities for personal development in the context of employment and life; Aware of personal strengths and emotional intelligence; Reflect on learning, seeking feedback on and evaluating personal practices, strengths and opportunities for personal growth.
Prepared to operate autonomously; Self-motivated, setting and achieving goals, prioritising tasks.
Verbal communication: Communicate orally in a clear and sensitive manner which is appropriately varied according to different audiences.
Written communication: Present arguments, knowledge and ideas, in a range of formats.

Study

Study time

Type	Required
Lectures	21 sessions of 1 hour (7%)
Seminars	9 sessions of 1 hour (3%)
Demonstrations	(0%)
Work-based learning	(0%)
Online learning (scheduled sessions)	30 sessions of 1 hour (10%)
Online learning (independent)	10 sessions of 1 hour (3%)
Other activity	10 hours (3%)
Private study	100 hours (33%)
Assessment	120 hours (40%)
Total	300 hours

Private study description

Self-guided study: Reading relevant chapters in the reading list, working on labsheets and other online exercises.
Group working: Working with group members on project
Professional development: Reflecting on learning and experience gained.

Other activity description

Online support and consultancy in support of assessments and group project work.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A2

Assessment component	Weighting	Study time	Eligible for self-certification
Programming Challenges	25%	30 hours	Yes (extension)

This individual portfolio assessment requires students to solve a series of analytical programming problems using code. In doing so, they will demonstrate their ability to recall and apply fundamental syntax, grammar, and algorithms in modern programming languages, along with

	Weighting	Study time	Eligible for self-certification

associated development techniques and tools. Their solutions should reflect strong analytical thinking, algorithmic reasoning, and programming proficiency by providing clear, efficient, and well-documented code.

Reassessment component

Programming Challenges			No

This resit portfolio assessment also requires students to solve a series of analytical programming problems using code. In doing so, they will demonstrate their ability to recall and apply fundamental syntax, grammar, and algorithms in modern programming languages, along with associated development techniques and tools. Their solutions should reflect strong analytical thinking, algorithmic reasoning, and programming proficiency by providing clear, efficient, and well-documented code.

Assessment component

Group Programming Project Report	50%	60 hours	No

A group report on a group-based programming project, either pre-defined or defined by apprentices and/or employers. The group mark is subject to peer adjustment.

Reassessment component

Programming Project Report			No

Individual reassessment: a predefined programming project in which the learner assumes both the role of team leader and team member at different stages, with potential collaborations with AI tools.

Assessment component

Initial Professional Development	25%	30 hours	Yes (extension)

Creation of an individual Initial Professional Development portfolio, which will include reflection on learning and experiences during the year, and setting of personal development action plans.

Reassessment component

Initial Professional			No

	Weighting	Study time	Eligible for self-certification
Development Creation of an individual Professional Development portfolio, which will include reflection on learning and experiences during the year, and setting of personal development action plans.			

Feedback on assessment

Feedback will be given as appropriate to the assessment type:
– Report: written summative feedback on reports.
– Portfolio: written feedback.

Availability

Courses

This module is Core for:

- Year 1 of DWMS-H655 Undergraduate Digital and Technology Solutions (Cyber) (Degree Apprenticeship)
- BSc Digital & Technology Solutions (Data Analytics)
- BSc Digital & Technology Solutions (Network Engineering)
- BSc Digital & Technology Solutions (Software Engineering)