# WM195-30 Smart Solutions Development (Programming)

### 24/25

Department WMG Level Undergraduate Level 1 Module leader Jianhua Yang Credit value 30 Module duration 42 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 taking place which is also driving every single industry to become more smart and adaptable. Smart and portable devices can display important information on touchscreens using software programs embodied in hardware. As such, programming skills are needed to create reconfigurable, customized and dependable programs that would not be only useful to improve customer experience but will also help the industry to differentiate itself from the other competitors. During the module, learners will also be introduced self-learning and development as 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

View reading list on Talis Aspire

### 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

#### Туре

Lectures Seminars Demonstrations Work-based learning Online learning (scheduled sessions) Online learning (independent) Other activity Private study Assessment Total

### Required

21 sessions of 1 hour (7%) 9 sessions of 1 hour (3%) (0%) (0%) 30 sessions of 1 hour (10%) 10 sessions of 1 hour (3%) 10 hours (3%) 100 hours (33%) 120 hours (40%) 300 hours

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### 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 A

|  | Weighting | Study time | Eligible for self-<br>certification |  |  |
|--|-----------|------------|-------------------------------------|--|--|
| Programming Challenges   | 25%       | 30 hours   | Yes (extension)                     |  |  |
| Solutions to 10 programming questions. This is an individual-based portfolio assessment and programming questions will be distributed throughout the teaching sessions. The solutions to each question should not typically exceed 30 lines of code. |           |            |                                     |  |  |

| Group Programming Project | 50%   | 60 hours | No  |
|---------------------------|-------|----------|-----|
| Report                    | 50 76 | 00110015 | INU |

Weighting

Study time

Eligible for selfcertification

A group report on a group-based programming project either pre-defined or defined by apprentices and employers.

Initial Professional<br/>Development25%30 hoursYes (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.

#### Feedback on assessment

Feedback will be given as appropriate to the assessment type:

- Report: written summative feedback on reports.
- Exam: written cohort-level feedback.
- Portfolio: written feedback.

# Availability

### Courses

This module is Core for:

- Year 1 of DWMS-H655 Undergraduate Digital and Technology Solutions (Cyber) (Degree Apprenticeship)
- Year 1 of DWMS-H652 Undergraduate Digital and Technology Solutions (Data Analytics) (Degree Apprenticeship)
- Year 1 of DWMS-H653 Undergraduate Digital and Technology Solutions (Network Engineering) (Degree Apprenticeship)
- Year 1 of DWMS-H654 Undergraduate Digital and Technology Solutions (Software Engineering) (Degree Apprenticeship)