Digital & Technology Solutions Degree Apprenticeship: Software Engineer Knowledge, Skills and Behaviours

This reference document is intended to help you understand the Digital & Technology Solutions (DTS) Professional Degree Apprenticeship Standard and the expected knowledge, skills and behaviours that Apprentices will develop through both the workplace and university teaching.

What is an Apprenticeship Standard?

An Apprenticeship Standard outlines the *knowledge, skills* and *behaviours* (KSBs) that Apprentices will develop over the course of their Apprenticeship.

All Apprenticeship standards can be found on the Institute for Apprenticeships & Technical Education website and the DTS Professional Degree Apprenticeship Standard can be found [here](#).

However, we have created this document for Employers and Apprentices to help you understand your standard and all of the KSBs you will develop throughout the four years on programme.

KSBs: Why are they important to me?

Apprentices on our DTS Professional Degree Apprenticeship you will develop:
- Year 1, 2, 3 & 4 KSB Targets for your Professional Discussion (Page 2-5)
- The Full Standard: Core Knowledge (Page 6 and 7)
- The Full Standard: Software Engineer Knowledge (Page 8)
- The Full Standard: Core Skills (Page 9 and 10)
- The Full Standard: Software Engineer Skills (Page 11)
- The Full Standard: Core Behaviours (Page 12)

The KSBs for this Apprenticeship programme were defined by employers and industry-experts and Manchester Metropolitan University have carefully planned our programme to ensure that the standard has been fully integrated and is met through our teaching. It is also expected that these KSBs will be developed through workplace activities and projects. Apprentices will complete a Skills Scan at the start of each year to monitor progress towards these KSBs and KSB development will be discussed in review meetings with an Apprentices allocated Skills Coach.

At End Point Assessment, Apprentices will be assessed on the KSBs they have demonstrated through a Synoptic Project Report, Presentation and Questions and formal Professional Discussion

As part of your End Point Assessment (EPA), you will have a formal professional discussion with an Independent Assessor. This Professional Discussion will provide you with an opportunity to demonstrate how you have met the KSBs mapped to this assessment method. This professional discussion will be underpinned by a portfolio of evidence. The questions in your EPA will be explored following the below themes:

THEME A: Underlying Principles   **THEME B: Technical Solutions**

THEME C: Innovation & Response   **THEME D: Legal, Ethics & Landscape**

Each year we will set you targets and ask you to collect evidence that demonstrates how you have met the KSBs mapped to this assessment method. Below you will see the Year 1 KSB targets:

K7	**Theme A**	The roles, functions and activities within digital technology solutions within an organisation.
K12	**Theme A**	The role of data management systems within Digital and Technology Solutions.
K13	**Theme A**	Principles of data analysis for digital and technology solutions.
S4	**Theme B**	Initiate, design, code, test and debug a software component for a digital and technology solution.
S10	**Theme B**	Initiate, design, implement and debug a data product for a digital and technology solution.
S11	**Theme B**	Determine and use appropriate data analysis techniques. For example, Text, Statistical, Diagnostic or Predictive Analysis to assess a digital and technology solutions.
B1	**Theme D**	Has a strong work ethic and commitment in order to meet the standards required.
B2	**Theme D**	Reliable, objective and capable of both independent and team working.
B4	**Theme C**	Commits to continuous professional development; maintaining their knowledge and skills in relation to developments in digital and technology solutions that influence their work.

Below you will see the Year 2 KSB targets:

K6	**Theme A**	The approaches and techniques used throughout the digital and technology solution lifecycle and their applicability to an organisation's standards and pre-existing tools.
K8	**Theme C**	How teams work effectively to produce digital and technology solutions.
K10	**Theme C**	Management techniques and theories. For example, effective decision making, delegation and planning methods, time management and change management.
K11	**Theme A**	The nature and scope of common vulnerabilities in digital and technology solutions. For example, the risks of unsecure coding and unprotected networks.
K14	**Theme A**	A range of quantitative and qualitative data gathering methods and how to appraise and select the appropriate method..
K16	**Theme A**	Fundamental computer networking concepts in relation to digital and technology solutions. For example, structure, cloud architecture, components, quality of service.
K20	**Theme D**	Sustainable development approaches as applied to digital and technology solutions such as green computing.
SEK3	**Theme A**	Principles of a range of development methods and approaches and the contexts in which they can be applied. For example, Scrum, Extreme Programming, Waterfall, Prince2, TDD.
S9	**Theme B**	Apply relevant security and resilience techniques to a digital and technology solution. For example, risk assessments, mitigation strategies.
S12	**Theme B**	Plan, design and manage simple computer networks with an overall focus on the services and capabilities that network infrastructure solutions enable in an organisational context.
B6	**Theme C**	Participates in and shares best practice in their organisation, and the wider community for aspects relevant to digital and technology solutions.
B7	**Theme C**	Maintains awareness of trends and innovations in the subject area, utilising a range of academic literature, online sources, community interaction, conference attendance and other methods which can deliver business value.

Below you will see the Year 3 KSB targets:

K9	**Theme C**	The concepts and principles of leadership.

K19	**Theme D**	Relevant legal, ethical, social and professional standards to a digital and technology solution. For example, Diversity, Accessibility, Intellectual Property, Data Protection Acts, Codes of Practice, Regulatory and Compliance frameworks.

SEK1	**Theme A**	How to operate at all stages of the software development life cycle and how each stage is applied in a range of contexts. For example, requirements analysis, design, development, testing, implementation.

SEK2	**Theme A**	Principles of a range of development techniques, for each stage of the software development cycle that produce artefacts and the contexts in which they can be applied. For example UML, unit testing, programming, debugging, frameworks, architectures.

S7	**Theme C**	Work effectively within teams, leading on appropriate digital technology solution activities.

S8	**Theme C**	Apply relevant organisational theories. For example, change management principles, marketing approaches, strategic practice, and IT service management to a digital and technology solutions project.

S15	**Theme D**	Apply relevant legal, ethical, social and professional standards to a digital and technology solution.

SES5	**Theme C**	Respond to changing priorities and problems arising within software engineering projects by making revised recommendations, and adapting plans as necessary, to fit the scenario being investigated.

SES6	**Theme C**	Determine, refine, adapt and use appropriate software engineering methods, approaches and techniques to evaluate software engineering project outcomes.

B8	**Theme D**	Champions diversity and inclusion in their work ensuring that digital technology solutions are accessible.

Manchester Metropolitan University

BSc Digital & Technology Solutions Degree Apprenticeship
Software Engineer
Year 4 Knowledge, Skills and Behaviours Targets

In the final year, you will spend time curating your final portfolio for submission to the Independent Assessor. There are therefore less KSB targets within this year to allow you time to effectively curate ahead of submission. Below you will see the Year 4 KSB targets:

| SEK4 | Theme B | How to interpret and implement a design, compliant with functional, non-functional and security requirements including principles and approaches to addressing legacy software development issues from a technical and socio-technical perspective. For example, architectures, languages, operating systems, hardware, business change. |

| SEK8 | Theme B | Approaches to effective teamwork and the range of software development tools supporting effective teamwork. For example, configuration management, version control and release management. |

| SES8 | Theme D | Extend and update software development knowledge with evidence from professional and academic sources by undertaking appropriate research to inform best practice and lead improvements in the organisation. |

Core Knowledge (K)

K1	How organisations adapt and exploit digital technology solutions to gain a competitive advantage.
K2	The principles of strategic decision making concerning the acquisition or development of digital and technology solutions. For example business architecture approaches such as capability models and target operating models.
K3	Principles of estimating the risks and opportunities of digital and technology solutions.
K4	Techniques and approaches involved in creating a business case for new digital and technology solutions. For example journey, product and capability mapping and value chains.
K5	A range of digital technology solution development techniques and tools.
K6	The approaches and techniques used throughout the digital and technology solution lifecycle and their applicability to an organisation's standards and pre-existing tools.
K7	The roles, functions and activities within digital technology solutions within an organisation.
K8	How teams work effectively to produce digital and technology solutions.
K9	The concepts and principles of leadership.
K10	Management techniques and theories. For example, effective decision making, delegation and planning methods, time management and change management.

Core Knowledge (K)

K11 — The nature and scope of common vulnerabilities in digital and technology solutions. For example, the risks of unsecure coding and unprotected networks.

K12 — The role of data management systems within Digital and Technology Solutions.

K13 — Principles of data analysis for digital and technology solutions.

K14 — A range of quantitative and qualitative data gathering methods and how to appraise and select the appropriate method..

K15 — Principles of estimating cost, and time resource constraints within digital and technology solutions activities.

K16 — Fundamental computer networking concepts in relation to digital and technology solutions. For example, structure, cloud architecture, components, quality of service.

K17 — Reporting techniques, including how to synthesise information and present concisely, as appropriate to the target audience.

K18 — Techniques of robust research and evaluation for the justification of digital and technology solutions.

K19 — Relevant legal, ethical, social and professional standards to a digital and technology solution. For example, Diversity, Accessibility, Intellectual Property, Data Protection Acts, Codes of Practice, Regulatory and Compliance frameworks.

K20 — Sustainable development approaches as applied to digital and technology solutions such as green computing.

Software Engineer Specialist Knowledge (SEK)

SEK1 — How to operate at all stages of the software development life cycle and how each stage is applied in a range of contexts. For example, requirements analysis, design, development, testing, implementation.

SEK2 — Principles of a range of development techniques, for each stage of the software development cycle that produce artefacts and the contexts in which they can be applied. For example UML, unit testing, programming, debugging, frameworks, architectures.

SEK3 — Principles of a range of development methods and approaches and the contexts in which they can be applied. For example Scrum, Extreme Programming, Waterfall, Prince2, TDD.

SEK4 — How to interpret and implement a design, compliant with functional, non-functional and security requirements including principles and approaches to addressing legacy software development issues from a technical and socio-technical perspective. For example architectures, languages, operating systems, hardware, business change.

SEK5 — The factors affecting product quality and approaches for how to control them throughout the development process. For example security, code quality, coding standards.

SEK6 — How to select and apply a range of software tools used in Software Engineering.

SEK7 — Approaches to the interpretation and use of artefacts. For example UML, unit tests, architecture.

SEK8 — Approaches to effective team work and the range of software development tools supporting effective teamwork. For example, configuration management, version control and release management.

Core Skills (S)

S1 — Analyse a business problem to identify the role of digital and technology solutions.

S2 — Identify risks, determine mitigation strategies and opportunities for improvement in a digital and technology solutions project.

S3 — Analyse a business problem in order to specify an appropriate digital and technology solution.

S4 — Initiate, design, code, test and debug a software component for a digital and technology solution.

S5 — Apply relevant standard processes, methods, techniques and tools. For example, ISO Standards, Waterfall, Agile in a digital and technology solution project.

S6 — Manage digital and technology solutions projects. For example, identifying and resolving deviations from specification, applying appropriate Project Management methodologies.

S7 — Work effectively within teams, leading on appropriate digital technology solution activities.

S8 — Apply relevant organisational theories. For example, change management principles, marketing approaches, strategic practice, and IT service management to a digital and technology solutions project.

Core Skills (S)

S9	Apply relevant security and resilience techniques to a digital and technology solution. For example, risk assessments, mitigation strategies.
S10	Initiate, design, implement and debug a data product for a digital and technology solution.
S11	Determine and use appropriate data analysis techniques. For example, Text, Statistical, Diagnostic or Predictive Analysis to assess a digital and technology solutions.
S12	Plan, design and manage simple computer networks with an overall focus on the services and capabilities that network infrastructure solutions enable in an organisational context.
S13	Report effectively to colleagues and stakeholders using the appropriate language and style, to meet the needs of the audience concerned.
S14	Research, investigate, and evaluate innovative technologies or approaches in the development of a digital and technology solution.
S15	Apply relevant legal, ethical, social and professional standards to a digital and technology solution.

Software Engineer SpecialistSkills (SES)

SES1
Identify and define software engineering problems that are non-routine and incompletely specified.

SES2
Provide recommendations as to the most appropriate software engineering solution.

SES3
Use appropriate analysis methods, approaches and techniques in software engineering projects to deliver an outcome that meets requirements.

SES4
Implement software engineering projects using appropriate software engineering methods, approaches and techniques.

SES5
Respond to changing priorities and problems arising within software engineering projects by making revised recommendations, and adapting plans as necessary, to fit the scenario being investigated.

SES6
Determine, refine, adapt and use appropriate software engineering methods, approaches and techniques to evaluate software engineering project outcomes.

SES7
Evaluate learning points arising from software engineering work undertaken on a project including use of methods, analysis undertaken, selection of approach and the outcome achieved, in order to identify both lessons learnt and recommendations for improvements to future projects.

SES8
Extend and update software development knowledge with evidence from professional and academic sources by undertaking appropriate research to inform best practice and lead improvements in the organisation.

Core Behaviours (B)

B1	Has a strong work ethic and commitment in order to meet the standards required.
B2	Reliable, objective and capable of both independent and team working.
B3	Acts with integrity with respect to ethical, legal and regulatory requirements ensuring the protection of personal data, safety and security.
B4	Commits to continuous professional development; maintaining their knowledge and skills in relation to developments in digital and technology solutions that influence their work.
B5	Interacts professionally with people from technical and non-technical backgrounds. Presents data and conclusions in an evidently truthful, concise and appropriate manner.
B6	Participates in and shares best practice in their organisation, and the wider community for aspects relevant to digital and technology solutions.
B7	Maintains awareness of trends and innovations in the subject area, utilising a range of academic literature, online sources, community interaction, conference attendance and other methods which can deliver business value.
B8	Champions diversity and inclusion in their work ensuring that digital technology solutions are accessible.