

# Digital: Digital Production, Design and Development

T Level outline content: final version for approval

**May 2018** 

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#### Introduction

T Levels are new two-year, level 3 study programmes that include a substantial technical qualification. They will enable students to secure skilled employment, by providing a mixture of:

- practical skills and knowledge specific to their chosen industry and occupation
- at least 45 days' industry placement in their chosen industry or occupation
- English, maths and digital skills.

T Levels will become one of three major options when a student reaches level 3, alongside apprenticeships for students who wish to study and train for a specific occupation 'on the job', and A levels for students who wish to continue academic education.

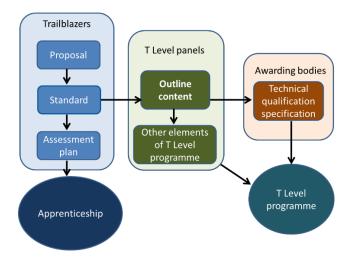
When they complete a T Level study programme, students will be able to choose between moving into a skilled occupation or further study, for example, a higher or degree level apprenticeship, or higher level technical study, including higher education.

Technical education has been categorised into fifteen different technical routes, according to occupational specialism. T Levels will be available across eleven of those routes, with occupations in the remaining four routes accessible through an apprenticeship only. Most routes have been split into a number of pathways; the T Level will broadly sit at pathway level. The occupations within scope for each T Level are set out in the Institute of Apprenticeships' occupational maps.

#### **Outline content**

This outline content has been produced by <u>T Level panels</u> of employers, professional bodies and providers, based on the same standards as those used for apprenticeships. The outline content will form the basis of the qualification specifications for T Level qualifications, which will be developed by awarding organisations for approval by the Institute for Apprenticeships. Awarding organisations will be appointed after a procurement process.

The diagram below demonstrates how the same standard created by employer-led Trailblazer groups is used for both Apprenticeships, and as the basis for this outline content. It also shows that this outline content will be used by awarding organisations to develop the full technical qualification specification.



Colleges and other education and training providers will decide how to structure the T Level courses they offer, based on the qualification specifications. This will enable them to deliver the study programme's mandatory components in the most effective way for students.

T Level study programmes will include the following mandatory elements:

- a 'core' set of underpinning knowledge, concepts and skills, tailored for their chosen industry and occupation: 'core content'
- specialist training covering occupational or industry-specific skills: 'occupational specialist content'
- an industry placement with an employer, which will last for 45 working days.

The diagram below demonstrates the different elements of a T Level programme. This outline content relates solely to the technical qualification part of a T Level programme.

# T Level programme 1800 hours over two years (with flexibility)

1800 hours over two years (with flexibility)

Students will need to achieve all components to achieve their T Level certificate

Subject content is set by T Level panels and approved/managed by the Institute for Apprenticeships

#### Technical qualification

Between 900-1400 hours

#### **Core Component**

- Knowledge of underpinning concepts, theories and principles relevant and the core workplace skills relevant to the T Level
- Assessed through an external examination and a substantial employer-set project

#### Occupational Specialisms

- Knowledge and skills required to achieve threshold competence<sup>1</sup> in an occupational specialism
- Maths, English and digital skills included where they are necessary to achieve threshold competence
- Students must complete at least one occupational specialism
- Assessed synoptically through rigorous practical assignments.

#### **Work Placement**

Between 315-420 hours

- · Undertaken with an external employer
- Minimum of 45 days
- Students develop technical skills and apply their knowledge in a workplace environment
- Provider should pay for/ contribute to travel and subsistence costs, if not covered by the employer

# Maths, English and digital requirements

- Students are expected to achieve level 2 in Maths and English, and higher levels if determined by T Level panels<sup>2</sup>
- Relevant digital skills will be developed through the technical qualification (as above)

# Other requirements set by T Level panels

e.g. licence to practice qualification of professional registration

Any further employability, enrichment and pastoral requirements

<sup>&</sup>lt;sup>1</sup>Threshold competence is as close to full occupational competence as can be reasonably expected of learners after two years of study in a provider based setting and be validated by employers as sufficient to secure skilled employment in a relevant role.

<sup>&</sup>lt;sup>2</sup> Students are expected to achieve a minimum level of Maths and English. Students can achieve this through GCSEs or a level 2 Functional Skills qualification. Under the Maynard recommendations, those with a care plan taking apprenticeships may have different entry level requirements for English and maths.

## **Purpose Statement**

#### **Qualification Purpose**

The purpose of the level 3 technical qualification is to ensure students have the knowledge, skills and behaviours needed to progress into skilled employment or higher level technical training relevant to the T Level.<sup>1</sup>

To achieve this, each level 3 technical qualification must:

- provide reliable evidence of students' attainment in relation to:
  - the core knowledge and skills relevant to the route and occupational specialisms covered by the qualification
  - the knowledge skills and behaviours required for at least one occupational specialism relevant to the qualification.
- be up-to-date, providing the knowledge, skills and behaviours needed for the occupations have continued currency among employers and others.
- ensure that maths, English and digital skills are developed and applied where they are essential to achieve occupationally relevant outcomes.
- ensure that the minimum pass grade standard for occupational specialisms attests to threshold competence, meets employer expectations, and is as close to full occupational competence as possible.
- allow the accurate identification of students' level of attainment and the effective differentiation of their performance.
- provide a clear and coherent basis for development of suitably demanding highquality level 3 courses, which enable students to realise their potential
- provide students with the opportunity to manage and improve their own performance
- support fair access to attainment for all students who take the qualification, including those with special educational needs and disabilities (SEND).

<sup>&</sup>lt;sup>1</sup> The Institute for Apprenticeships may only approve the qualification "if satisfied that by obtaining the qualification a person demonstrates that he or she has attained as many of the outcomes set out in the standards as may reasonably be expected to be attained by undertaking a course of education" (sA2DA(3) of the 2009 Act).

# **Technical Qualification Design**

T Level programmes will differ in length to reflect the requirements of different occupations, but are expected to last 1800 hours over two years (on average).

To accommodate legitimate differences in content across T Levels, we propose that the total time for the technical qualification:

- will fall within a defined range of between 900 and 1400 hours
- is no less than 50% of the time for the T Level programme as a whole and
- is no more than 75% of the total time for the programme as a whole.

Component	Content	Assessment	Grading	Planned Hours
Core Students complete one component which covers all the core content	Knowledge and understanding of contexts, concepts, theories and principles relevant to the T Level	Assessed through an externally set test and an employer-set project	Six point scale plus ungraded (U)  A* – E and U	Between 20% and 50% of the qualification time
	Ability to apply core knowledge and skills, through a project, to meet employer-set requirements			
Occupational specialisms Students must complete at least one, or more depending on the minimum requirements specific to the qualification	Knowledge, skills and behaviours needed to achieve threshold competence	Synoptic assessment of performance outcomes, to determine whether a student meets the minimum requirements for threshold competence	Three point scale plus ungraded (U)  Distinction, Merit, Pass and Ungraded	Between 50% and 80% of qualification time

# Digital: Digital Production, Design and Development Core content

The core content relates to the whole route, and the pathway that the qualification covers. This content will vary depending on the requirements of the route and the pathway or occupations covered by the scope of the qualification.

The core content focuses on students' knowledge and understanding of contexts, concepts, theories, principles and core skills relevant to the T Level. This could include, where appropriate, assessment of knowledge, understanding and skills relevant to the route and the pathway. This breadth of content will help to ensure students are able to apply their skills in a variety of contexts and for a variety of different purposes.

The core content is assessed through an examination and a practical employer-set project. Awarding organisations can integrate knowledge in the employer-set project, to contextualise of core skills. The allocation of content to each type of assessment will need to be approved by the Institute for Apprenticeships.

#### Core knowledge and understanding

Element	Content		
Business Context	The business environment, including the importance of serving customer, end user and business needs.		
	The value of Digital to the business:		
	Technical change management including:		
	• risk		
	• impact		
	<ul><li>configuration</li><li>document</li></ul>		
	<ul><li>document</li><li>request for change</li></ul>		
	roll back planning		
	reproducibility		
	traceability.		
	Examples of how organisations respond to change, why change is needed, and change management procedures relevant to Digital in a range of contexts:  • societal  • technological  • environmental		
	economic		

-	political.
	The significance of target audience, including:
Culture	Ethical and moral issues that an increasing reliance on technology raises e.g. autonomous operation, changing behaviours, addiction.
Data	Concepts and fundamentals of data, including:
Digital Concepts	Algorithms.
	Abstraction.
	Action.
	Decomposition.
	Pattern recognition.
Digital Environments	Computing systems fundamentals including physical, virtual and cloud:
	<ul> <li>physical systems: including hardware, peripherals, operating software, software</li> <li>devices, servers, Internet of Things</li> <li>networking fundamentals</li> <li>virtualization technologies.</li> </ul> Cloud: <ul> <li>terminology</li> <li>concepts.</li> </ul>

Diversity and inclusion	The value of difference and being sensitive to the needs of others, especially when they are different from one's own, this includes understanding the relevant legislation:  • protected characteristics.
Learning	Emerging technology trends and innovation.
	Reflection techniques.
	The breadth of sources of knowledge:  • reliable and unreliable e.g. internet and search engines, academic papers.
Legislation	The importance of keeping up with the most recent legislation, including professional practice, security standards, regulations and their consequences across at least two sectors; the role of criminal and other law; key relevant features of UK and international law.
	Legal and regulatory requirements e.g. Data Protection, Security, Intellectual Property Rights (IPR), Data sharing, marketing consent, personal data definition.
	The role and importance of Industry Standards and where to find them (e.g. ISO standards, IETF RFCs).
Planning	The principles of planning including:  time
	• cost
	• quality.
Security	The importance of maintaining privacy and confidentiality of company information, as well as that of customers and colleagues.
	Processes and protocols used to ensure internet security, including concepts of security assurance.
	Threats and vulnerabilities including the following areas:     technical     physical
	• human.
	The interrelationship between security, identity, confidentiality, integrity, availability, threat, vulnerability and risk management.
Testing	A fundamental understanding of the importance of testing for all components (including software, hardware, data), interfaces and the resulting service.
	Application of root cause analysis to problems.

Tools	Digital tools and their use in business: <ul> <li>management and presentation tools</li> <li>evaluation tools and techniques.</li> </ul>
	Examples of collaborative technologies:              communication tools and technologies for collaborative working e.g. discussion threads, document collaboration, markdown.

### **Employer-set project**

The employer-set project ensures students have the opportunity to combine core knowledge and skills to develop a substantial piece of work in response to an employer-set brief.

To ensure consistency in project scope and demand, awarding organisations will develop assessment objectives, which require learners to:

- plan their approach to meeting the brief
- · apply core knowledge and skills as appropriate
- · select relevant techniques and resources to meet the brief
- use maths, English and digital skills as appropriate
- realise a project outcome and review how well the outcome meets the brief.

The awarding organisation will work with a relevant employer or employers, to devise a set brief that:

- ensures a motivating starting point for students' projects, for example, a real-world problem to solve
- ensures students can generate evidence that covers the assessment objectives
- is manageable for providers to deliver
- is officially approved by the AO and employer.

For software application design and development, in achieving the assessment objectives and meeting the brief, students must demonstrate the following core skills:

- reflective evaluation
- communicate information clearly to a technical and non-technical audience
- work with others to clarify user needs and develop software design specifications
- develop software
- create an artefact
- apply a logical approach to solving problems, identifying and fixing defects and proposing software solutions
- ensure software development activity mitigates risks to security.

# **Occupational Specialist Content**

Specialist content is structured into different occupational specialisms, which correspond to the apprenticeship standards listed on the occupational map covered by the T Level. Occupational specialisms ensure students develop the knowledge, skills and behaviours necessary to achieve 'threshold competence' in the occupational specialism.

Achievement of threshold competence signals that a student is well-placed to develop full occupational competence, with further support and development, once in work (including an apprenticeship). The knowledge and skills listed are required to achieve one or more 'performance outcomes'. These indicate what the student will be able to do as a result of learning and applying the specified knowledge and skills.

In essence, each performance outcome describes, at a high level, what the student 'can do' to have achieved threshold competence in an occupational specialism.

#### Performance Outcome 1: Analyse a problem to define requirements and acceptance criteria aligned to user needs

Knowledge Specific to Performance Outcome	Skills	Maths, English and Digital
Software Development Lifecycle (SDLC) Methodologies, including sequential and iterative.	Outline the business context and understand roles and responsibilities.	Select, prioritise and summarise main ideas, using appropriate language and structure (verbal or written).
Software and business:  • measurable value of software as an asset in business		

<ul> <li>processes and business models</li> <li>context and market environment</li> <li>roles and responsibilities.</li> </ul> Software requirements, including functional	Define a range of problems from the perspective of a user.	Give clear, precise and coherent explanations for a given purpose and audience (verbal or written).  Understand and employ technical language
and non-functional.		appropriately.
Analytical models.		
Principles of problem analysis.		
Stakeholder analysis, including the actors, the story, and their roles across the life of the software, development and use.		
Acceptance criteria, including identification, value and use.	Implement functional and non-functional requirements.	Use digital evidence to solve problems and answer questions.
		Understand digital research methods and data analysis tools and techniques.
		Adopt professional approaches to using digital communications and social media.
		Choose devices, applications, software and systems relevant to different tasks, having assessed their benefits and constraints.
		Develop an awareness of user experience analysis and its principles.

Apply analytical decomposition and elicitation techniques.	Select, prioritise and summarise main ideas, using appropriate language and structure (verbal or written).  Optimise work processes.
Demonstrate how Key Performance Indicators (KPIs) can be used to frame and measure desired outcomes.	Choose devices, applications, software and systems relevant to different tasks, having assessed their benefits and constraints.  Give clear, precise and coherent explanations for a given purpose and audience (verbal or written).
Develop and use acceptance criteria.	Understand innovation, enterprise and project management in digital settings.  Understand and employ technical language appropriately.

Identify and plan learning opportunities.	Identify and participate in digital learning opportunities.
	Plan learning in basic digital skills by making use of available resources including online tutorials, FAQs and advice forums.
	Keep up to date with digital developments in the work environment, adopting new techniques to improve productivity in business.
Apply critical thinking e.g. problem analysis.	

# Performance Outcome 2: Design, implement and test software

Knowledge Specific to Performance Outcome	Skills	Maths, English and Digital
<ul> <li>Design: <ul> <li>architecture and design including tools, models, patterns and standards</li> <li>self-documenting code, including purpose and structure</li> <li>interface design, including User and API</li> <li>databases</li> <li>networks</li> <li>platforms</li> <li>performance constraints</li> <li>data dictionary/library</li> <li>data types and structures.</li> </ul> </li> </ul>	Implement secure code in at least two appropriate languages of different types which is maintainable, readable, functional.	Read, understand and follow instructions.  Give clear, precise and coherent explanations for a given purpose and audience (verbal or written).  Demonstrate an understanding of the relationship between text and image.  Understand and employ technical language appropriately.  Use rules and formulae.

Implement:	Design software solutions to meet a requirement using tools and techniques.	Read, understand and synthesise written information.  Read, understand and follow instructions.  Understand and employ technical language appropriately.  Optimise work processes.
<ul> <li>languages, shell scripting</li> <li>a range of languages</li> <li>code review</li> <li>deployment</li> </ul>	Demonstrate how to work in a shared codebase, practice, etiquette, tools.	Choose devices, applications, software and systems relevant to different tasks, having assessed their benefits and constraints.
<ul> <li>scalability, availability, reliability.</li> </ul>	Use code organisation techniques, including classes, methods, sub-routines, re-factoring, open source, functions, modules.	Understand and employ technical language appropriately.  Use rules and formulae.
<ul> <li>fundamental principles of testing in the SDLC, test levels and test</li> </ul>		Optimise work processes.
<ul> <li>process</li> <li>debugging vs. testing and test first</li> <li>test types, including functional, nonfunctional, structural, change-related and regression</li> </ul>	Integrate code which meets the functionality of the task, complies with the required standards and includes appropriate code documentation.	Read, understand and follow written instructions.  Optimise work processes.
<ul> <li>static testing and reviews</li> <li>Test Techniques including Black Box and White Box</li> <li>Test Management, including strategy, approach, planning, control and risk</li> </ul>	Implement systems including User Interface, Database, Service, Persistence, Web, Simple, Layered systems	Collate, manage, access and use digital data in spreadsheets, databases and other formats, and interpret data by running queries, data analyses and reports.
<ul><li>management</li><li>Test Tool types and uses</li><li>defect management</li></ul>		Understand digital media as a social, political and educational tool, and of digital media production as a technical practice.

quality assurance.		
quality accuration.		Select, prioritise and summarise main ideas, using appropriate language and structure (verbal or written).
		Demonstrate an understanding of the relationship between text and image.
		Process data.
		Understand data.
	Apply testing principles, types, techniques and tools.	Optimise work processes.
	Use simple debugging techniques.	
	Perform code reviews.	Optimise work processes.
	Apply creativity e.g. design thinking, writing a test, implementation of a test plan.	
	Demonstrate observing techniques.	
	Apply a range of recording techniques.	
	Use a range of communication techniques by adapting style and tone e.g. with the user, technical and non-technical	Select communication modes for different business interactions.
	(storyboard).	Use business etiquette when communicating.
		Adopt professional approaches to using digital communications and social media.

	Share information securely.
Identify and investigate ways of learning.	

# Performance Outcome 3: Change, maintain and support software

Knowledge Specific to Performance Outcome	Skills	Maths, English and Digital
<ul> <li>Change:         <ul> <li>why change is needed, e.g. regulatory, review, test</li> </ul> </li> <li>change requirements and the implications on the code e.g. risk</li> <li>communication methods and formats e.g. updates, functionality change, technical and non-technical</li> <li>understand software specific release management concepts at all stages.</li> </ul>	Communicate change, taking account of audience, frequency, timing and channels.	Select communication modes for different business interactions.  Use business etiquette when communicating.  Adopt professional approaches to using digital communications and social media.  Share information securely.
Software maintenance:		Understand innovation, enterprise and project management in digital settings.  Understand and employ technical language appropriately.
Support:              need for support (e.g. bug fixes)             causes of software issues             communication methods             audience e.g. technical and non - technical, internal and external.	Follow a change process e.g. implications on code, analysis of requirements, communication process.	Communicate using mathematics.  Represent with mathematical diagrams.  Use rules and formulae.

Root cause analysis.		Optimise work processes.
	Add a feature and fix a bug in an unfamiliar application, whilst ensuring maintainability.	
	Test software as part of the maintenance cycle using techniques such as regression testing.	Select, prioritise and summarise main ideas, using appropriate language and structure (verbal or written).
		Understand and employ technical language appropriately.
		Optimise work processes.
		Use rules and formulae.
	Identify the cause of a problem e.g. user error, system error, application error.	Give clear, precise and coherent explanations for a given purpose and audience (verbal or written).
		Understand and employ technical language appropriately.
		Process data.
	Identify the causes of a software issue.	Give clear, precise and coherent explanations for a given purpose and audience (verbal or written).
		Understand and employ technical language appropriately.
	Refactor code without changing its behaviour.	Use rules and formulae.

Use a range of communication techniques by adapting style and tone.	
Apply a range of recording techniques.	

#### Performance Outcome 4: Create solutions in a social and collaborative environment

Knowledge Specific to Performance Outcome	Skills	Maths, English and Digital
Collaborative technologies:  communication tools and technologies, for collaborative working e.g. discussion threads, document collaboration, markdown  code collaboration technologies e.g. version control, source control, Integrated Development Environments (IDEs).	Use communication tools and technologies for source and version control.  Use communication tools and technologies for writing technical documentation for, and adapting to, specific audience(s).  Use a range of communication styles.	Select communication modes for different business interactions.  Use business etiquette when communicating.  Adopt professional approaches to using digital communications and social media.  Share information securely.
Audience:	Observe e.g. cultural awareness and diversity:  • Timezones, localisation.	Participate in digital teams and working groups.  Understand and apply appropriate accessibility requirements e.g. W3C.  Be proactive in peer learning.  Understand and employ technical language appropriately.

	Evaluate the impact of vocabulary, form and grammatical/ organisational features on the reader.
	Understand and employ technical language appropriately.
	Communicate using mathematics.

# Performance Outcome 5: Discover, evaluate and apply reliable sources of knowledge

Knowledge Specific to Performance Outcome	Skills	Maths, English and Digital
Sources of knowledge:  • reliable and unreliable e.g. internet and search engines,	Identify (up to three) reliable sources, and assess their reliability.	Using rules and formulae (Boolean search criteria).
academic papers and peers.  Evaluation techniques.	Demonstrate the validity and appropriateness of the information and its legitimate use.	Boolean and set operations (AND OR and NOT).
Communication methods e.g. code comments, commit messages and forums.	Corroborate across multiple sources.	Process data. Understand data.
	Search for information relevant to a topic or scenarios.	Optimise work processes.
	Select and use techniques and tools to aid evaluation.	Qualify information sources evaluating their reliability and suitability for a purpose.
	Compare options, appraise and recommend actions.	Take a critical approach to evaluating information in terms of its provenance, relevance, value and credibility.
	Identify and understand bias.	

Demonstrate critical thinking e.g. triangulation /evaluation of sources.	Participate in and benefit from digital learning opportunities, using digital techniques to identify and store learning e.g. solutions to common problems.  Participate in, facilitate and build digital networks.  Read, understand, evaluate and compare a range of materials, identifying bias and misuse of information where appropriate.  Give clear, precise and coherent explanations for a given purpose and audience (verbal or written).  Evaluate the impact of vocabulary, form and grammatical/organisational features on the reader.  Read, understand, evaluate and compare a range of materials, identifying bias and misuse of information where appropriate.
Use research and referencing skills.	
Demonstrate how to analyse.	
Use investigative techniques.	
Plan, for example, a work schedule.	
Prioritise and self-manage tasks.	

Use a range of communication techniques.	
Evaluate information.	

# Performance Outcome 6: Apply ethical principles and manage risks in line with legal and regulatory requirements when developing software

Knowledge Specific to Performance Outcome	Skills	Maths, English and Digital
Legal and regulatory requirements that apply to software development e.g. data protection, security, Intellectual Property	Source regulatory and legal information and territorial restrictions.	Follow licensing guidelines, using only approved and licensed software applications.
Rights (IPR):	Check for the existence of and follow	
<ul> <li>software rights, copyrights and patent.</li> </ul>	guidelines or rules that underpin regulations.	Understand the rules of copyright and open alternatives e.g. creative commons, and
Standards and where to find them e.g. ISO standards, IETF RFCs.	Identify, quantify and mitigate risks using a basic framework.	reference digital works appropriately in digital contexts.
Principles of risk management, including identification, quantification and mitigation of	Adhere to codes of conduct in a community, and recognise inappropriate behaviour.	Act safely and responsibly in digital environments.
risks.	Demonstrate methods to reduce the risk and impact of attack.	Develop and project a positive digital identity and manage digital reputation.
Ethical implications that apply to software	•	
engineering e.g. hijacking code, software licensing.	Apply and maintain procedures and security controls to ensure confidentiality, integrity	Understand the benefits and risks involved in digital participation.
Codes of conduct, implications of hacking	and availability.	Seek support from approved sources and
and non-compliance.	Apply information law in the use of client	escalate security related issues.
	data e.g. not using personally identifiable information in test systems, making sure	Understand how data is used in professional and public life.

Ethical and moral issues that are raised by	personal actions comply with ICO	
increasing reliance on technology e.g.	regulations.	Be aware of information security and the
autonomous operation, changing		security controls that can be used to
behaviours, addiction.		mitigate security threats within solutions and
D'''		services.
Different means of attack on a business		Estimate calculate and among bead.
through different vectors, e.g. software and		Estimate, calculate and error-check.
social.		Mark with properties
Dangers and losses that may occur both to		Work with proportion.
organisations and individuals through		Select and use a range of reference
attacks, through denial of service and theft of		materials and appropriate resources.
personal information.		materials and appropriate resources.
poroonal illianom		Read, understand and synthesise written
		information.
		Understand and employ technical language
		appropriately.
		Give clear, precise and coherent
		explanations for a given purpose and
		audience (verbal or written).
	Use a range of observational techniques to	
	inform situational awareness	