



Level 4 Diploma in Internet of Things (Smart Home)

Qualification Specification

November 2024

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Contents

About QUALIFI.....	4
Why Choose QUALIFI Qualifications?.....	4
Employer Support for the Qualification Development	4
Equality and Diversity	4
Qualification Title and Accreditation Number	5
Qualification Aims and Learning Outcomes.....	5
Aims of the QUALIFI Level 4 Diploma in Internet of Things (Smart Home)	5
Learning Outcomes of the QUALIFI Level 4 Diploma in Internet of Things (Smart Home).....	5
Delivering the Qualification	6
External Quality Assurance Arrangements.....	6
Learner Induction and Registration.....	6
Entry Criteria.....	6
Recognition of Prior Learning	7
Data Protection.....	7
Learner Voice.....	7
Professional Development and Training for Centres	7
Progression and Links to other QUALIFI Programmes	8
Qualification Structure and Requirements	9
Credits and Total Qualification Time (TQT)	9
Rules of Combination for QUALIFI Level 4 Diploma Internet of Things (Smart Home)	9
Achievement Requirements	10
Awarding Classification/Grading	10
Assessment Strategy and Methods.....	10
Unit Specifications.....	11
Unit IOTD401: Network Device Installation and Debugging (Smart Home)	11
Unit IOTD402: Integrated Wiring of Information Networks (Smart Home).....	14
Unit IOTD403: App End Application Development (Smart Home).....	16
Unit IOTD404: Engineering (Smart Home)	20
Unit IOTD406: System Integration (Smart Home).....	24

Assessment Guidance	26
Contact Details	29

About QUALIFI

QUALIFI is recognised and regulated by Ofqual (Office of Qualifications and Examinations Regulator). Our Ofqual reference number is RN5160. Ofqual regulates qualifications, examinations, and assessments in England.

As an Ofqual recognised Awarding Organisation, QUALIFI is required to carry out external quality assurance to ensure that centres approved for the delivery and assessment of QUALIFI's qualifications meet the required standards.

Why Choose QUALIFI Qualifications?

QUALIFI qualifications aim to support learners to develop the necessary knowledge, skills and understanding to support their professional development within their chosen career or to provide opportunities for progression to further study.

Our qualifications provide opportunities for learners to:

- apply analytical and evaluative thinking skills
- develop and encourage problem solving and creativity to tackle problems and challenges
- exercise judgement and take responsibility for decisions and actions
- develop the ability to recognise and reflect on personal learning and improve their personal, social, and other transferable skills.

Employer Support for the Qualification Development

During the development of this qualification QUALIFI consults with a range of employers, providers, and existing centres (where applicable) to ensure rigour, validity and demand for the qualification and to ensure that the development considers the potential learner audience for the qualification and assessment methods.

Equality and Diversity

QUALIFI's qualifications are developed to be accessible to all learners who are capable of attaining the required standard. QUALIFI promotes equality and diversity across aspects of the qualification process and centres are required to implement the same standards of equal opportunities and ensure teaching and learning are free from any barriers that may restrict access and progression.

Learners with any specific learning need should discuss this in the first instance with their approved centre who will refer to QUALIFI's Reasonable Adjustment and Special Consideration Policy.

Qualification Title and Accreditation Number

This qualification has been accredited to the Regulated Qualification Framework (RQF) and has its own unique Qualification Accreditation Number (QAN). This number will appear on the learner's final certification document. Each unit within the qualification has its own RQF code. The QAN for this qualification is as follows:

Qualifi Level 4 Diploma in Internet of Things (Smart Home) - 610/5031/3

Qualification Aims and Learning Outcomes

Aims of the QUALIFI Level 4 Diploma in Internet of Things (Smart Home)

The aim of the QUALIFI Level 4 Diploma in Internet of Things (Smart Home) is to provide learners with a fundamental knowledge and understanding of the Internet of Things and smart home. Learners will develop practical skills in IoT system equipment installation and maintenance; smart home deployment and implementation, and application development.

Successful completion of the QUALIFI Level 4 Diploma in Internet of Things (Smart Home) provides learners with the opportunity to progress to further study or employment.

Learning Outcomes of the QUALIFI Level 4 Diploma in Internet of Things (Smart Home)

The overall learning outcomes of the qualification are for learners to:

1. Select Internet of Things smart home system devices.
2. Develop cloud platform service technologies.
3. Develop technology for smart home applications on the App end.
4. Develop technology for external endpoints.
5. Install, debug, operate and maintain IoT smart home systems.
6. Identify software errors through logs.
7. Upgrade smart home firmware.

The learning outcomes and assessment criteria for each unit are outlined in the unit specifications.

Delivering the Qualification

External Quality Assurance Arrangements

All centres are required to complete an approval process to be recognised as an approved centre. Centres must have the ability to support learners. Centres must commit to working with QUALIFI and its team of External Quality Assurers (EQAs). Approved Centres are required to have in place qualified and experienced tutors, all tutors are required to undertake regular continued professional development (CPD).

Approved centres will be monitored by QUALIFI External Quality Assurers (EQAs) to ensure compliance with QUALIFI requirements and to ensure that learners are provided with appropriate learning opportunities, guidance, and formative assessment.

QUALIFI's guidance relating to invigilation, preventing plagiarism and collusion will apply to centres.

QUALIFI, unless otherwise agreed:

- sets all assessments;
- moderates assessments prior to certification;
- awards the final mark and issues certificates.

Learner Induction and Registration

Approved Centres should ensure all learners receive a full induction to their study programme and the requirements of the qualification and its assessment.

All learners should expect to be issued with the course handbook and a timetable and meet with their personal tutor and fellow learners. Centres should assess learners carefully to ensure that they are able to meet the requirements qualification and that, if applicable, appropriate pathways or optional units are selected to meet the learner's progression requirements.

Centres should check the qualification structures and unit combinations carefully when advising learners. Centres will need to ensure that learners have access to a full range of information, advice and guidance to support them in making the necessary qualification and unit choices. During recruitment, approved centres need to provide learners with accurate information on the title and focus of the qualification for which they are studying.

All learners must be registered with QUALIFI within the deadlines outlined in the QUALIFI Registration, Results and Certification Policy and Procedure.

Entry Criteria

Approved Centres are responsible for reviewing and making decisions as to the applicant's ability to complete the learning programme successfully and meet the demands of the qualification. The initial assessment by the centre will need to consider the support that is readily available or can be made available to meet individual learner needs as appropriate.

The qualification has been designed to be accessible without artificial barriers that restrict access. For this qualification, applicants must be aged 18 or over.

Recognition of Prior Learning

Recognition of Prior Learning (RPL) is a method of assessment (leading to the award of credit) that considers whether learners can demonstrate that they can meet the assessment requirements for a unit through knowledge, understanding or skills they already possess and so do not need to develop through a course of learning.

QUALIFI encourages centres to recognise learners' previous achievements and experiences whether at work, home or at leisure, as well as in the classroom. RPL provides a route for the recognition of the achievements resulting from continuous learning. RPL enables recognition of achievement from a range of activities using any valid assessment methodology. Provided that the assessment requirements of a given unit or qualification have been met, the use of RPL is acceptable for accrediting a unit, units, or a whole qualification.

Evidence of learning must be valid and reliable. For full guidance on RPL please refer to QUALIFI's *Recognition of Prior Learning Policy*.

Data Protection

All personal information obtained from learners and other sources in connection with studies will be held securely and will be used during the course and after they leave the course for a variety of purposes and may be made available to our regulators. These should be all explained during the enrolment process at the commencement of learner studies. If learners or centres would like a more detailed explanation of the partner and QUALIFI policies on the use and disclosure of personal information, please contact QUALIFI via email support@QUALIFI-international.com

Learner Voice

Learners can play an important part in improving the quality through the feedback they give. In addition to the on-going discussion with the course team throughout the year, centres will have a range of mechanisms for learners to feedback about their experience of teaching and learning.

Professional Development and Training for Centres

QUALIFI supports its approved centres with training related to our qualifications. This support is available through a choice of training options offered through publications or through customised training at your centre.

The support we offer focuses on a range of issues including:

- planning for the delivery of a new programme
- planning for assessment and grading

- developing effective assignments
- building your team and teamwork skills
- developing learner-centred learning and teaching approaches
- building in effective and efficient quality assurance systems.

Please contact us for further information.

Progression and Links to other QUALIFI Programmes

Completing the **QUALIFI [enter qualification title]** will enable learners to progress to:

- QUALIFI
- Employment in an associated profession.

Qualification Structure and Requirements

Credits and Total Qualification Time (TQT)

The **QUALIFI Level 4 Diploma in Internet of Things (Smart Home)** is made up of **52 credits** which equates to 520 hours of TQT.

Total Qualification Time (TQT): is an estimate of the total amount of time that could reasonably be expected to be required for a learner to achieve and demonstrate the achievement of the level of attainment necessary for the award of a qualification.

Examples of activities that can contribute to Total Qualification Time include guided learning, independent and unsupervised research/learning, unsupervised compilation of a portfolio of work experience, unsupervised e-learning, unsupervised e-assessment, unsupervised coursework, watching a prerecorded podcast or webinar, unsupervised work-based learning.

Guided Learning Hours (GLH): are defined as the time when a tutor is present to give specific guidance towards the learning aim being studied on a programme. This definition includes lectures, tutorials and supervised study in, for example, open learning centres and learning workshops, live webinars, telephone tutorials or other forms of e-learning supervised by a tutor in real time. Guided learning includes any supervised assessment activity; this includes invigilated examination and observed assessment and observed work-based practice.

Rules of Combination for QUALIFI Level 4 Diploma Internet of Things (Smart Home)

All units are mandatory.

Unit Reference	Unit Title	Level	Credit	GLH	TQT
M/651/4016	Network Device Installation and Debugging (Smart Home)	4	12	80	120
R/651/4017	Integrated Wiring of Information Networks (Smart Home)	4	8	60	80
T/651/4018	App End Application Development (Smart Home)	4	8	60	80
Y/651/4019	Engineering (Smart Home)	4	8	60	80
F/651/4020	Embedded Technology Applications (Smart Home)	4	8	60	80
H/651/4021	System Integration (Smart Home)	4	8	60	80
Total			52	380	520

Achievement Requirements

Learners must demonstrate they have met all learning outcomes and assessment criteria for all the required units to achieve this qualification. QUALIFI will issue certificates to all successful learners via their registered centres.

Awarding Classification/Grading

This qualification grading is **Pass/Fail**].

All units will be internally assessed through written assignment, internally marked by the QUALIFI approved centre and subject to external quality assurance by QUALIFI.

Assessment Strategy and Methods

The tasks will enable learners to draw on work-related information and/or examples wherever possible. Some assessment tasks will contain a practical assignment which will require observation by an assessor, see Assessment Guidance for further information.

The assessment tasks will require learners to draw on real organisational information or case studies to illustrate their answers. To support this activity during the programme of learning, centres are required to make sure that they include case studies of relevant organisations and, wherever possible, encourage learners to draw on work-place opportunities to undertake research and investigation to support their learning.

Learner assessments will be internally marked by the approved centre and will be subject to external moderation by QUALIFI prior to certification.

Unit Specifications

Unit IOTD401: Network Device Installation and Debugging (Smart Home)

Unit code: M/651/4016

RQF Level: 4

Unit Aim

The aim of this unit is to develop learners' understanding, installation, and debugging skills for computer network devices required by smart home systems. Learners will gain a solid foundation in the basic knowledge and practical applications of computer networks, be able to install, debug, and troubleshoot network faults for smart home devices, preparing them for future employment in the smart home field.

Learning Outcomes, and Assessment Criteria

Learning Outcomes. To achieve this unit a learner must be able to:		Assessment Criteria: Assessment of these outcomes demonstrates a learner can:	
1.	Be able to plan home and small-to-medium local area networks (LANs).	1.1	Analyze the requirements of home and small-to-medium local area networks (LANs).
		1.2	Develop a plan based on the identified requirements.
2.	Be able to implement an integrated cabling	2.1	Design an integrated cabling scheme according to the overall network plan.
		2.2	Create twisted pair cables following the T568 standard.
		2.3	Create information sockets.
3.	Be able to install switch in LANs	3.1	Install, and configure the power, network, and configuration interfaces of switches.
		3.2	Carry out initial settings for the switch, including username, password, and management IP.
		3.3	Configure ports, link aggregation, and control access lists.
		3.4	Use appropriate tools to test network connectivity.
		3.5	Identify and resolve common issues including link failures and configuration errors).
4.	Be able to Install router in LANs	4.1	Install and configure the power, network, and configuration interfaces of the router.
		4.2	Carry out initial setup for the router, including username, password, and management IP.

		4.3	Configure the WAN port, LAN port, DHCP services, control access and firewall settings.
		4.4	Configure routing protocols .
		4.5	Use appropriate tools to test internal and external network connectivity.
		4.6	Identify and troubleshoot common issues including link failures, configuration errors.
		4.7	Use appropriate tools to analyze and optimise network traffic.
5.	Be able to configure network service for network connections	5.1	Install and configure network operating systems, such as Windows Server.
		5.2	Install and configure appropriate network services like DHCP, DNS, IIS, etc.
		5.3	Use network debugging tools.
6.	Be able to Install firewalls	6.1	Explain the configuration of firewall rules and policies.
		6.2	Install software or hardware firewalls.
		6.3	Configure and debug Virtual Private Networks (VPN).
7.	Be able to analyse network faults	7.1	Select and use network fault detection tools.
		7.2	Troubleshoot common network faults, including cable issues, configuration problems, and software conflicts.
8.	Be able to test and accept network engineering	8.1	Complete cable testing independently.
		8.2	Perform validation tests on network devices.
		8.3	Conduct network project acceptance according to the overall network solution requirements.

Indicative Content

Installation tools such as Ping, Traceroute

Routing protocols such as static routes, RIP

Appropriate network services such as DHCP, DNS, IIS

Network debugging tools such as Wireshark, Tcpcat

Network fault detection tools such as Ipconfig, Netstat, Route, Speedtest

- Network planning and design
- Network integrated wiring
- Installation and debugging of switches
- Router installation and debugging
- Installation and debugging of network services
- Firewall installation and debugging
- Analysis and troubleshooting of network failures
- Network testing and acceptance

Unit IOTD402: Integrated Wiring of Information Networks (Smart Home)

Unit code: R/651/4017

RQF level: 4

Unit Aim

This unit focuses on the network engineering design and construction, maintenance, and management required for smart homes. The primary objectives are to develop learners' abilities in network engineering design, construction, implementation, selection and debugging of network equipment, and fault analysis and resolution. Special emphasis is placed on learners' skills in designing, analysing, constructing, troubleshooting comprehensive wiring projects, and fostering independent innovation capabilities.

Learning Outcomes, and Assessment Criteria

Learning Outcomes. To achieve this unit a learner must be able to:		Assessment Criteria: Assessment of these outcomes demonstrates a learner can:	
1.	Understand the basic concepts of integrated cabling systems	1.1	Describe the main components, advantages, and design principles of integrated cabling systems.
		1.2	Compare and contrast international, national, and industry standards for integrated cabling and the reasons for any differences.
2.	Be able to design work area subsystems	2.1	Explain key design considerations for work area subsystems.
		2.2	Create connectors to support work area subsystems
		2.3	Create point statistical tables to support work area subsystems.
3.	Be able to design horizontal subsystems	3.1	Explain construction and design technical requirements of the horizontal subsystem.
		3.2	Process and lay common auxiliary parts for pipes and slots.
4.	Be able to design management room subsystems	4.1	Explain design and construction technical requirements for management room subsystems.
		4.2	Assemble and connect distribution frames.
		4.3	Install cabinets and equipment within cabinets according to cabinet diagrams correctly .
5.	Be able to design vertical wiring subsystems	5.1	Explain design and construct technical requirements of vertical wiring subsystems.
		5.2	Use binding tape and numbering methods to make labels correctly .

		5.3	Operate optical fiber fusion splicers and perform fiber splicing independently.
6.	Understand equipment room subsystems design rules	6.1	Explain design and construct requirements of equipment room subsystems.
		6.2	Explain construction standards and techniques for anti-static flooring.
		6.3	Explain design and construction standards and techniques for grounding
		6.4	Explain the standard for the design and construct of shielding projects.
7.	Be able to conduct testing and accept integrated cabling subsystem	7.1	Perform testing using cable testers and optical path testers.
		7.2	Read and interpret test reports and compile completion reports.

Indicative Content

Network Integrated Cabling - main components, international, national, and industry standards

Work area subsystem - key design considerations, connectors such as twisted-pair cables, crystal heads, and modules, point statistical tables

Construction and design technical requirements:

- Horizontal subsystem wiring system
- Management room subsystem
- Vertical room subsystem
- Equipment room subsystem

Testing and acceptance of integrated wiring system- cable testers and optical path testers, test reports, completion reports.

Unit IOTD403: App End Application Development (Smart Home)

Unit code: T/651/4018

RQF level: 4

Unit Aim

Through the study of this unit, learners will gain knowledge related to application development on the Android platform, develop good programming habits, and acquire the ability to develop mobile applications, specifically capable of undertaking tasks related to smart home app development on the Android platform.

Learning Outcomes, and Assessment Criteria

Learning Outcomes. To achieve this unit a learner must be able to:		Assessment Criteria: Assessment of these outcomes demonstrates a learner can:	
1.	Understand the basics of Android development	1.1	Explain Android architecture, interaction between components, and relationships between different layers.
		1.2	Explain basic concepts and principles of multi-threading, asynchronous operations, event handling, and message passing.
2.	Be able to perform the basic operation of Android development	2.1	Set up the Android development environment, configure JDK and SDK, and create a Hello World program.
		2.2	Schedule Android applications,
3.	Be able to develop Android UI	3.1	Use XML-based layouts, and apply layout managers like LinearLayout, RelativeLayout, and ConstraintLayout for multi-screen adaptation.
		3.2	Use styles and themes, including component colors, backgrounds, fonts, and component stylesheets.
4.	Be able to use Activity components	4.1	Explain the calling sequence and functions of Activity lifecycle methods.
		4.2	Explain the usage scenarios for different transition methods
		4.3	Implement transitions between Activities in an application,
		4.4	Implement data transfer methods in Activities using Intent, CallbackInterface, ViewModel, and LiveData to pass basic data.
5.	Be able to Implement Android data storage techniques	5.1	Serialise data into XML format using common XML parsing libraries, and parse XML data.

		5.2	Use SharedPreferences for reading and storing data in Android applications.
		5.3	Exchange data between Activity, Service, and BroadcastReceiver using SharedPreferences.
6.	Be able to utilise SQLite databases	6.1	Create an SQLite database in an Android program to Perform operations including: <ul style="list-style-type: none"> • creating tables • inserting • querying • updating • deleting data.
		6.2	Use ListView in an Android program to retrieve data from an SQLite database,
		6.3	Display the retrieved data as a list and save changes back to the database.
7.	Be able to use content providers	7.1	Manage Content Provider permissions, in an Android program to access data from other applications.
		7.2	Query system-provided or custom Content Providers in an Android program
		7.3	Perform operations including: <ul style="list-style-type: none"> • adding • deleting • updating • querying data.
		7.4	Register content observers in an Android program, monitor data changes,
		7.5	perform appropriate actions when data changes.
8.	Be able to use Broadcast Receiver	8.1	Create a BroadcastReceiver in an Android program and register it either in the manifest file or through code.
		8.2	Declare the necessary permissions for the BroadcastReceiver
		8.3	Handle security vulnerabilities and perform exception handling in the Android program.
		8.4	Register and receive system broadcasts) in an Android application,
		8.5	Process and display the received broadcast information.

		8.6	Create custom broadcasts in an Android program and define custom Actions and Extras ,Implement the logic for the corresponding Broadcast Receiver.
9.	Be able to Deploy Android services	9.1	Create a Service class in an Android application, including: <ul style="list-style-type: none"> • inheriting from the Service class and implementing the appropriate callback methods, • starting the service with the startService method, • binding the service with the bindService method.
		9.2	Describe the service lifecycle the execution order and functions of methods including onCreate, onStartCommand, onBind, onUnbind, and onDestroy within the service.
		9.3	Use Intent, Messenger, and Broadcast to facilitate communication between services in the program.
10.	Be able to execute network programming	10.1	Use HttpURLConnection to access the network and initiate HTTP requests, including GET and POST requests.
		10.2	Manage asynchronous network requests and network request errors, make asynchronous network requests in applications
		10.3	Catch potential exceptions such as timeouts and no network connection.
		10.4	Submit form data using HTTP POST requests in applications, including encoding form data as URL parameters or in JSON format
		10.5	Implement file uploads using multi-part form data format, including file selection and upload operations.
		10.6	Describe the implementation of multi-threaded code using common libraries.

Indicative Content

Lifecycle methods such as onCreate, onStart, onResume

System broadcasts such as network status, battery changes

Common libraries such as OkHttp

Implementation of multi-threaded code including like breakpoint continuation, thread management and synchronisation, download progress, and status management

Basic architecture of the Android platform

Construction of Android development environment

- Developing Android UI
- Using components such as Activity
- Design of data storage on the Android platform
- Using SQLite Database
- Using ContentProvider
- Using BroadcastReceiver
- Building an Android Service
- Performing network programming

Unit IOTD404: Engineering (Smart Home)

Unit code: Y/651/4019

RQF level: 4

Unit Aim

This unit provides practical, project-based learning on IoT, enabling learners to perform project requirement analysis, design smart home projects, and install and debug smart home devices and systems according to specifications and standards.

Learning Outcomes, and Assessment Criteria

Learning Outcomes. To achieve this unit a learner must be able to:		Assessment Criteria: Assessment of these outcomes demonstrates a learner can:	
1.	Be able to develop IoT system design capabilities	1.1	Design IoT system solutions based on user needs.
		1.2	Determine the IoT system architecture based on the system plan.
		1.3	Identify IoT gateways and cloud platforms based on communication and networking plans.
		1.4	Define edge computing platforms based on the IoT system management platform.
2.	Be able to install IoT devices	2.1	Build hardware systems according to requirements and operational standards.
		2.2	Edit IoT device program code as required.
		2.3	Produce standardised documentation
3.	Be able to enhance networks and debug IoT system	3.1	Construct and debug network environments based on IoT solutions.
		3.2	Network devices in conjunction with IoT system equipment.
		3.3	Conduct communication tests in conjunction with devices, IoT gateways, and edge computing platforms.
		3.4	Collect and process sensor data using IoT management platforms.
		3.5	Draw network topology maps and data flow diagrams based on device data and networking status.
4.	Be able to Implement IoT system edge computing	4.1	Process sensor data based on IoT solutions and edge computing platforms.
		4.2	Implement decision logic and automate equipment linkage based on user needs and sensor data.

		4.3	Manage and allocate computing, storage, and bandwidth resources on the edge computing platform effectively.
		4.4	Establish secure and reliable protection and fault tolerance mechanisms for the edge computing platform to ensure system stability.
5.	Be able to Integrate IoT system data with the cloud platform	5.1	Create corresponding products, physical models, and devices according to cloud platform requirements.
		5.2	Integrate local IoT gateways, indirect, and direct devices with the cloud platform.
		5.3	Forward necessary data to the appropriate cloud platform in conjunction with IoT gateways and sensor data.
		5.4	Establish a visualisation monitoring dashboard for the IoT system, enabling data visualisation and remote monitoring.
		5.5	Develop automatic monitoring and alarm mechanisms in conjunction with the cloud platform.

Indicative Content

- Designing IoT systems
- Installing and debugging IoT devices
- Networking the IoT system
- Edge computing in IoT systems
- Uploading IoT system data to the cloud

Unit IOTD405: Embedded Technology Applications (Smart Home)

Unit code: F/651/4020

RQF level: 4

Unit Aim

Through learning and practice, this unit enables learners to understand the architecture of the ARM Cortex-M3 series microcontrollers, the configuration of STM32 system clocks, comprehend the protocols and usage details of related interface buses, and acquire skills in building and programming multi-machine communication systems based on STM32 series microprocessors.

Learning Outcomes, and Assessment Criteria

Learning Outcomes. To achieve this unit a learner must be able to:		Assessment Criteria: Assessment of these outcomes demonstrates a learner can:	
1.	Be able to perform the basic operations of embedded systems	1.1	Explain the software and hardware components, characteristics, classification, and development
		1.2	Install and use integrated development environments including Keil uVision5.
2.	Be able to utilise General Purpose Input/Output (GPIO)	2.1	Establish and configure projects based on the STM32F3 Standard Peripheral Library.
		2.2	Design the minimal system for STM32 microcontrollers.
		2.3	Configure system clocks according to application requirements.
		2.4	Configure GPIO input/output ports according to application requirements.
3.	Be able to utilise Universal Synchronous/Asynchronous Receiver Transmitter (USART) interface	3.1	Explain the basic principles, operating modes, and parameter settings of USART, including
		3.2	Complete circuit connections, software configurations, and perform data transmission and
4.	Be able to utilise Serial Peripheral Interface (SPI)	4.1	Explain the basic operational steps of SPI.
		4.2	Configure sensors and read sensor data using the SPI interface.
5.	Be able to utilise Inter-Integrated Circuit (I2C)	5.1	Explain the basic operational steps of I2C.
		5.2	Configure sensors and read sensor data using the IIC interface.
6.	Be able to utilise Timer (TIM)	6.1	Apply TIM to achieve PWM output.

		6.2	Set and control the timer to blink an LED at fixed intervals.
7.	Be able to utilise Analog-to-Digital Converter (ADC)	7.1	Use ADC regular channels to convert external analog input signals to digital.
		7.2	Use ADC injected channels to measure temperature using the internal temperature sensor.
8.	Be able to utilise Nested Vectored Interrupt Controller (NVIC)	8.1	Implement button operations using NVIC.
		8.2	Implement USART communication using NVIC.
		8.3	Implement timer (TIM) interrupt operations using NVIC.
9.	Be able to utilise Direct Memory Access (DMA)	9.1	Perform basic DMA operations (initialisation and DMA transfer control).
		9.2	Implement USART operations using DMA.

Indicative Content

- Perform basic operations on embedded systems
- Using GPIO
- Using USART
- Using SPI
- Using I2C
- Using TIM
- Using ADC
- Using NVIC
- Using DMA

Unit IOTD406: System Integration (Smart Home)

Unit code: H/651/4021

RQF level: 4

Unit Aim

This unit introduces learners to the key technologies of IoT system integration. Using case studies, learners become familiar with the technologies and examples of IoT (Smart Home) system integration. They will gain preliminary y of current digital communication interface technologies, sensor system integration, and the basic knowledge and application skills of IoT communication and networking technologies. Learners will be equipped with the professional technical capabilities to innovate interconnected products, perform wireless networking, maintain products, and provide pre-sales and post-sales services in the field of IoT (Smart Home).

Learning Outcomes, and Assessment Criteria

Learning Outcomes. To achieve this unit a learner must be able to:		Assessment Criteria: Assessment of these outcomes demonstrates a learner can:	
1.	Understand key IoT system integration technologies	1.1	Explain typical IoT applications in life and work settings.
		1.2	Analyse key technologies in IoT (Smart Home) applications.
2.	Be able to use digital communication interface	2.1	Explain the types and characteristics of communication interface technologies.
		2.2	Select and design communication interfaces (e.g., USB, Ethernet, Serial, Wireless) according to specific scenario requirements.
3.	Be able to design sensor system integration solutions	3.1	Explain common sensor components, their functions, and parameter characteristics.
		3.2	Evaluate and select sensors based on specific scenario requirements.
		3.3	Design a sensor integration solution according to the scenario's needs.
4.	Understand the theoretical knowledge of wireless communication network technologies	4.1	Explain the development and main technologies of wireless communication.
		4.2	Summarise the characteristics of short-range communication and interface technologies, including NFC, RFID, Bluetooth, and ZigBee.
		4.3	Explain the features and applications of cellular mobile communication technologies including GPRS, NB-IoT, and UMTS-LTE.

		4.4	Select appropriate network communication technologies based on practical requirements.
5.	Be able to use wireless identification technology	5.1	Explain the use of bar code technology in life, engineering, and industrial settings.
		5.2	Select and use tags (active, passive, and semi-active tags).
		5.3	Configure and operate barcode readers to ensure system functionality and optimal performance.
		5.4	Process and integrate data, including decoding, transmission, storage, and analysis, as well as integrating with other information systems for data sharing and collaboration.
		5.5	Perform system fault diagnosis, troubleshooting, and resolution.

Indicative Content

- IoT system integration
- Using digital communication interface
- Planning sensor system integration solutions
- Wireless communication network technology
- Using wireless identification technology

Assessment Guidance

For the assessment of knowledge and understanding criteria, learners are required to provide written responses to the questions in this workbook, providing examples drawn from the workplace or case studies where possible. It is a requirement that learners are able to analyse and demonstrate their understanding by use of theories, principles and models that are relevant to the subject matter.

The assessment of the following competence criteria is by completion of a practical task:

- **Unit IOTD401 Network Device Installation and Debugging (Smart Home)**

Learning outcome 1 AC 1.1, 1.2 will be assessed through a written assignment.

Learning outcome 2 AC 2.1, 2.2, 2.3 will be assessed through practical observation.

Learning outcome 3 AC 3.1, 3.2, 3.3, 3.4, 3.5 will be assessed through practical observation.

Learning outcome 4 AC 4.1, 4.2, 4.3, 4.4, 4.5, 4.6 4. will be assessed through practical observation.

Learning outcome 5 AC 5.1, 5.2, 5.3 will be assessed through practical observation.

Learning outcome 6 AC 6.1, 6.2, 6.3 will be assessed through practical observation.

Learning outcome 7 AC 7.1, 7.2 will be assessed through a written assignment.

Learning outcome 8 AC 8.1, 8.2, 8.3 will be assessed through practical observation.

- **Unit IOTD402 Integrated Wiring of Information Networks (Smart Home)**

Learning outcome 1 AC 1.1, 1.2 will be assessed through practical observation.

Learning outcome 2 AC 2.1, 2.2, 2.3 will be assessed through a written assignment.

Learning outcome 3 AC 3.1, 3.2 will be assessed through a written assignment.

Learning outcome 4 AC 4.1, 4.2, 4.3 will be assessed through a written assignment.

Learning outcome 5 AC 5.1, 5.2, 5.3 will be assessed through practical observation.

Learning outcome 6 AC 6.1, 6.2, 6.3, 6.4 will be assessed through a written assignment.

Learning outcome 7 AC 7.1, 7.2 will be assessed through a written assignment.

- **Unit IOTD403 App End Application Development (Smart Home)**

Learning outcome 1 AC 1.1, 1.2 will be assessed through a written assignment.

Learning outcome 2 AC 2.1, 2.2 will be assessed through a written assignment.

Learning outcome 3 AC 3.1, 3.2 will be assessed through a written assignment

Learning outcome 4 AC 4.3, 4.4 will be assessed through practical observation.

Learning outcome 5 AC 5.1, 5.2, 5.3 will be assessed through practical observation.

Learning outcome 6 AC 6.1, 6.2, 6.3 will be assessed through practical observation.

Learning outcome 7 AC 7.1, 7.2, 7.3, 7.4, 7.5 will be assessed through practical observation.

Learning outcome 8 AC 8.1, 8.2, 8.3, 8.4, 8.5, 8.6 will be assessed through practical observation.

Learning outcome 9 AC 9.1, 9.2, 9.3 will be assessed through practical observation.

Learning outcome 10 AC 10.1, 10.2, 10.3, 10.4, 10.5, 10.6 will be assessed through practical observation.

- **Unit IOTD404 Engineering (Smart Home)**

Learning outcome 1 AC 1.1, 1.2, 1.3, 1.4 will be assessed through a written assignment.

Learning outcome 2 AC 2.1, 2.2, 2.3 will be assessed through practical observation..

Learning outcome 3 AC 3.1, 3.2, 3.3, 3.4, 3.5 will be assessed through practical observation.

Learning outcome 4 AC 4.1, 4.2, 4.3, 4.4 will be assessed through a written assignment.

Learning outcome 5 AC 5.1, 5.2, 5.3, 5.4, 5.5 will be assessed through practical observation.

- **Unit IOTD405 Embedded Technology Applications(Smart Home)**

Learning outcome 1 AC 1.1, 1.2 will be assessed through practical observation.

Learning outcome 2 AC 2.1, 2.2, 2.3, 2.4 will be assessed through practical observation.

Learning outcome 3 AC 3.1, 3.2 will be assessed through practical observation.

Learning outcome 4 AC 4.1, 4.2 will be assessed through practical observation.

Learning outcome 5 AC 5.1, 5.2 will be assessed through practical observation.

Learning outcome 6 AC 6.1, 6.2 will be assessed through practical observation.

Learning outcome 7 AC 7.1, 7. will be assessed through practical observation.

Learning outcome 8 AC 8.1, 8.2, 8.3 will be assessed through practical observation.

Learning outcome 9 AC 9.1, 9.2 will be assessed through practical observation.

- **Unit IOTD406 System Integration(Smart Home)**

Learning outcome 1 AC 1.1, 1.2 will be assessed a through a written assignment.

Learning outcome 2 AC 2.1, 2.2 will be assessed through a written assignment.

Learning outcome 3 AC 3.1, 3.2, 3.3 will be assessed through a written assignment.

Learning outcome 4 AC 4.1, 4.2, 4.3, 4.4, 4.5 will be assessed through a written assignment.

Learning outcome 5 AC 5.1, 5.2, 5.3, 5.4, 5.5 will be assessed through a written assignment.

This may be assessed by using Internet of Things information from the learner's workplace or by using case studies. Assessors should observe the learners undertaking these activities and use question and answer to assess the learner's understanding of the task, a summary of the Internet of Things information used by the learner should be appended to the assignment when submitted.

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