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empowering the telecoms world

Certificate & Diploma in Telecoms

Specialist Learning Pathways:

- Cellular Radio Engineer
- Core Network Engineer
- LTE Engineer
- 5G Engineer

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Wray Castle Certified Training Series

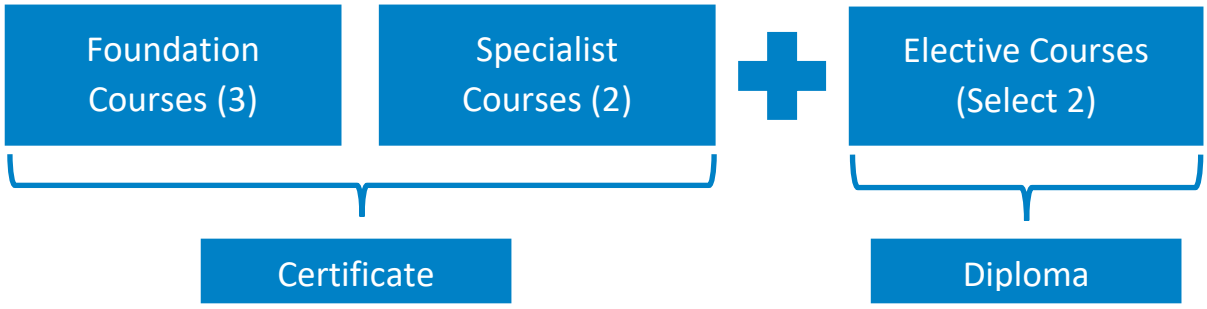
Cellular Radio Engineer | Core Network Engineer | LTE Engineer | 5G Engineer

Become a certified expert in Cellular Radio, Core Network, LTE or 5G Engineering with our Certificate and Diploma in Telecoms programme. We have combined some of our most popular training courses to build guided learning pathways enabling you to demonstrate your expertise and competence in your chosen field. You are *never* alone as you progress through our self-study online material because both the Certificate and Diploma level programme are fully supported by our expert tutors.

Each complete self-paced on-demand distance learning programme includes an extensive blend of core reading materials, video resources, quizzes and a dedicated Instructor. All in a modern, intuitive and secure cross-device Virtual Learning Environment.

Certificate programme students' study the three foundation courses plus two specialist courses. The Diploma level programme allowing you to widen your knowledge base, by selecting an additional two courses from a portfolio of over 18 leading Wray Castle courses.

How do the Certificate and Diploma programmes differ?



What specialisms are available?

- Cellular Radio Engineer
- Core Network Engineer
- LTE Engineer
- 5G Engineer

Who would benefit?

Our Certificate and Diploma in Telecoms has been designed for anyone working within the telecoms industry from new starters looking to build their technical knowledge from the ground up to more experienced engineers looking to formalise and expand their knowledge base.

Rigorous testing, regular digital badging and certification ensures that successful students are able to demonstrate the breadth and depth of their knowledge.

Programme Duration:

- **Certificate in Telecoms:** 120 Hours Study Time (10 Months)
- **Diploma in Telecoms:** 148 Hours Study Time (14 Months)

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What sets our certified training programmes apart?

- **Focused specialist learning pathways** – guide you through the material and enable you to become an expert in your chosen field.
- **Full Tutor support** – from industry experts with decades of experience throughout your studies.
- **Flexible learning** – study at a time, location and pace of your choice, allowing you to fit your study into your schedule.
- **24 months access** –access to the all the training materials for 2 years, allowing you to refer back to the material after your studies.
- **Extended learning** – Diploma students have the opportunity to study two additional courses to further expend their learning.
- **Regular testing and Digital Badges** – allow you to demonstrate the depth of your knowledge, to the same standard as used by other Wray Castle clients including Vodafone Group.
- **High quality end of programme certificate issued by Wray Castle** – all students successfully completing either the Certificate or Diploma programmes are issued with a high-quality certificate complete with a grade transcript.
- **Developed and certified by Wray Castle** – the leading supplier of training the global telecoms industry with over 58 years' experience.

Enrolment Fees

- Certificate: £1,995 (+VAT)
- Diploma: £2,995 (+VAT)
- Upgrade from Certificate to Diploma: £1,295 (+VAT)

Bespoke In-Company Schemes

The Certificate and Diploma programmes provide the ideal structure for formalising training programmes for teams across your business. Contact us on info@wraycastle.com to discuss these options and pricing.

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Certificate & Diploma in Telecoms

Specialist programmes at a glance

Certificate (5 Courses)

Learners Study 3 Foundation Courses + 2 Specialist Courses

Foundation Courses

Technology Foundation
2G to 5G Mobile Technologies
Telecoms – as an Industry and Business

Specialist Learning Pathways

Cellular Radio Engineer	Core Network Engineer	LTE Engineer	5G Engineer
LTE Air Interface 5G Air Interface	LTE Evolved Packet Core 5G Architecture & Protocols	LTE Air Interface LTE Evolved Packet Core	5G Air Interface 5G Architecture and Protocols

Diploma (+ 2 Elective Courses)

Learners study any 2 additional elective courses from:

5G Air Interface	LTE & 5G Security	Business Finance (with a Telecoms Focus)
5G Architecture and Protocols	LTE Voice – VoLTE	Strategy (with a Telecoms Focus)
5G Cell Planning	GSM-R Engineering Overview	Developing and Communicating Compelling Customer Propositions
5G Radio Access Networks	ERTMS/ETCS for Radio Engineers	Evaluating & Optimising the Business Model(s)
5G Service Based Architecture and Core Network	FRMCS	
LTE Air Interface	eSIM Engineering	
LTE Evolved Packet Core	Microwave Link Planning	

Programme Duration:

- **Certificate in Telecoms:** 10 Months (120 Hours Study Time)
- **Diploma in Telecoms:** 14 Months (148 Hours Study Time)

Notes:

- Learners wishing to study for a different combination of module can do so on request.
- Business Courses available in 2022

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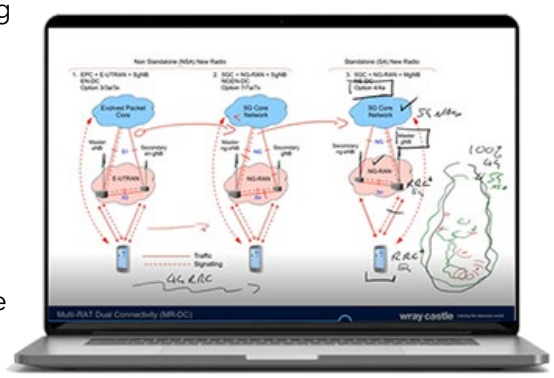
Programme Format - How you will learn?

Learn anytime at you own pace

Our Certificate and Diploma Programmes are accessible on any computer, tablet or smartphone and allow you to study at a time and location that is convenient to you.

Each course features a thorough analysis of the topic and includes:



- **Illustrated Course Books** - featuring leading edge knowledge from subject matter experts. Available for you to download and keep for your personal use after the programme.
- **Videos** - Detailed videos expand the points covered in the course books, discussing topics in greater depth.
- **Tutor Support** – Dedicated course tutors are available to answer any questions you might have throughout your studies.
- **Formative Assessment** - Courses include regular quizzes to support learning by testing your knowledge of the subject matter.
- **Digital Badges** – Successfully complete the end of module tests to earn Digital Badges to demonstrate the depth of your knowledge of the topic.

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Syllabus - Foundation Courses

This course enables you to gain a through foundation in the telecoms industry and the technologies on which it's based. Learners are required to complete and pass the courses prior to progressing to study the specialist learning pathways.

Course Modules

Technology Fundamentals

(Study Time: 24 Hours)

Designed for those who do not have a technical background and are new to the telecoms industry or those who are currently working in the sector. The historical background to telecommunications is described and the technologies, abbreviations and techniques that are employed are explained.

Course Modules:

- Defining Telecoms and the Nature of Information
- A Historical Background to the Telecom Network
- Digital Fixed Telecom Networks
- Data Networks
- Mobile Networks and Wi-Fi
- Broadband and Emerging Networks

2G to 5G Mobile Technologies

(Study Time: 24 Hours)

Providing a technical overview of the main cellular technologies 2G (GSM), 3G (UMTS), 4G (LTE) and 5G in one package. It details the most important aspects of cellular communication technologies and how the principles are applied within the different generations as networks evolve from providing basic GSM services, through to supporting an increasingly complex set of connection requirements and services.

Course Modules:

- Principles of Mobile Cellular Networks
- 2nd Generation Mobile Networks
- 3rd Generation Mobile Networks
- 4th Generation Mobile Networks
- 5th Generation Mobile Networks

Telecoms – as an Industry and Business

(Study Time: 24 Hours)

Exploring the overall make-up of the industry and the business dynamics; the types of organisations involved and their roles and relationships; the service propositions; and main customer segments. We also briefly consider company strategy and business models. An evaluation of the key technologies that support the industry is made, including projections, time-lines and overall market trajectories.

Course Modules:

- Telecoms Industry & Business Dynamics
- The Technology Explained & Evaluated
- Telecoms Industry & Market Update

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Syllabus - Cellular Radio Engineer

LTE Air Interface

(Study Time: 24 Hours)

A detailed technical description of the air interface for LTE radio access. This includes OFDMA principles, access and non-access stratum protocols, channel structures, connectivity and mobility management procedures along with radio link control functions.

Course Modules:

- LTE Overview
- OFDM Principles
- Physical Layer Structure
- Layer 2 Protocols
- Radio Resource Control
- LTE-Advanced
- Lower Layer Procedures

5G Air Interface

(Study Time: 24 Hours)

This course provides a detailed technical description of the air interface for the 5G New Radio. It covers the principles of mm wave and multiple antenna communications, the architecture of the AI's physical layer, the higher layer air interface protocols, and the signalling procedures for 5G devices.

Course Modules:

- Introduction to 5G
- Principles of the 5G New Radio
- Introduction to the Physical Layer
- Physical Layer Implementation and Procedures
- Higher Layer Protocols
- Signalling Procedures
- Releases 16 and 17

Syllabus - Core Network Engineer

LTE Evolved Packet Core

(Study Time: 24 Hours)

A detailed technical description of the Evolved Packet Core (EPC) for LTE systems. This includes EPC architecture and interfaces, service provision concepts, application of IP technologies, overall protocol architectures and (optionally) a review of IMS functionality.

Course Modules:

- LTE Overview
- Evolved Packet Core Data
- Transport in the EPC
- Major Protocols
- EPC Operation
- Release 9 and Beyond

5G Architecture and Protocols

(Study Time: 24 Hours)

A technical description of the core and radio access networks of 5G. It covers the architecture and interfaces used by 5G, the protocols used for signalling and data transport, the provision of services over a 5G network, and the procedures for signalling and system operation.

Course Modules:

- Introduction to 5G
- Radio Access Network Architecture
- Core Network Architecture
- Data Transport
- 5G Protocols
- 5G Procedures
- Releases 16 and 17

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Syllabus - LTE Engineer

LTE Air Interface

(Study Time: 24 Hours)

A detailed technical description of the air interface for LTE radio access. This includes OFDMA principles, access and non-access stratum protocols, channel structures, connectivity and mobility management procedures along with radio link control functions.

Course Modules:

- LTE Overview
- OFDM Principles
- Physical Layer Structure
- Layer 2 Protocols
- Radio Resource Control
- LTE-Advanced
- Lower Layer Procedures

LTE Evolved Packet Core

(Study Time: 24 Hours)

This course provides a detailed technical description of the air interface for the 5G New Radio. It covers the principles of mm wave and multiple antenna communications, the architecture of the AI's physical layer, the higher layer air interface protocols, and the signalling procedures for 5G devices.

Course Modules:

- Introduction to 5G
- Principles of the 5G New Radio
- Introduction to the Physical Layer
- Physical Layer Implementation and Procedures
- Higher Layer Protocols
- Signalling Procedures
- Releases 16 and 17

Syllabus – 5G Engineer

5G Air Interface

(Study Time: 24 Hours)

This course provides a detailed technical description of the air interface for the 5G New Radio. It covers the principles of mm wave and multiple antenna communications, the architecture of the AI's physical layer, the higher layer air interface protocols, and the signalling procedures for 5G devices.

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- Principles of the 5G New Radio
- Introduction to the Physical Layer
- Physical Layer Implementation and Procedures
- Higher Layer Protocols
- Signalling Procedures
- Releases 16 and 17

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A technical description of the core and radio access networks of 5G. It covers the architecture and interfaces used by 5G, the protocols used for signalling and data transport, the provision of services over a 5G network, and the procedures for signalling and system operation.

Course Modules:

- Introduction to 5G
- Radio Access Network Architecture
- Core Network Architecture
- Data Transport
- 5G Protocols
- 5G Procedures
- Releases 16 and 17

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Elective Modules

Students may upgrade from the Certificate programme to the Diploma programme by successfully completing a further two elective courses, you can choose from the following:

5G Courses

5G Air Interface

(Study Time: 24 Hours)

A detailed technical description of the air interface for the 5G New Radio. It covers the principles of mm wave and multiple antenna communications, the architecture of the AI's physical layer, the higher layer air interface protocols, and the signalling procedures for 5G devices.

Course Modules:

- Introduction to 5G
- Principles of the 5G NR
- Introduction to the Physical Layer
- Physical Layer Implementation and Procedures
- Higher Layer Protocols
- Signalling Procedures
- Releases 16 and 17

5G Architecture and Protocols

(Study Time: 24 Hours)

A technical description of the core and radio access networks of 5G. It covers the architecture and interfaces used by 5G, the protocols used for signalling and data transport, the provision of services over a 5G network, and the procedures for signalling and system operation.

Course Modules:

- Introduction to 5G
- Radio Access Network Architecture
- Core Network Architecture
- Data Transport
- 5G Protocols
- 5G Procedures
- Releases 16 and 17

5G Cell Planning

(Study Time: 24 Hours)

This course will guide you through the variables that impact both coverage and capacity, at the conclusion of this training the student will be well versed in the theory and practice of 5G cell planning with a good understanding of both the principles and application of planning techniques.

Course Modules:

- Fundamentals of the 5G Air Interface
- Link Budget Estimation
- Coverage Estimation
- Capacity Estimation
- RSRP, RSRQ and SINR
- Parameter Setting

5G Radio Access Networks

(Study Time: 24 Hours)

Exploring the key features of a 5G network before delving into the finer detail of the 5G New Radio. The 5G RAN is described in terms of network architecture, base station characteristics, spectrum usage and multiple antenna configurations.

Course Modules:

- Introduction to 5G
- The Next Generation Radio Access Network
- Signalling Protocols & Procedures in the NG-RAN
- Signalling Procedures in the
- Releases 16 and 17

5G SBA and Core Network

(Study Time: 24 Hours)

This course examines the 5G Core and SBA supporting protocols and technologies, as well as a thorough examination of the Service Based Interface (SBI) and Service.

Course Modules:

- 5G introduction and Deployment Options
- PDU Connectivity Services and PDU Sessions
- HTTP/2
- Service Based Interface (SBI)
- Procedures
- 5G Access Security and SBA Domain Security

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LTE Courses

LTE Air Interface

(Study Time: 24 Hours)

A detailed technical description of the air interface for LTE radio access. This includes OFDMA principles, access and non-access stratum protocols, channel structures, connectivity and mobility management procedures along with radio link control functions.

Course Modules:

- LTE Overview
- OFDM Principles
- Physical Layer Structure
- Layer 2 Protocols
- Radio Resource Control
- LTE-Advanced
- Lower Layer Procedures

LTE Evolved Packet Core

(Study Time: 24 Hours)

A detailed technical description of the Evolved Packet Core (EPC) for LTE systems. This includes EPC architecture and interfaces, service provision concepts, application of IP technologies, overall protocol architectures and (optionally) a review of IMS functionality.

Course Modules:

- LTE Overview
- OFDM Principles
- Physical Layer Structure
- Layer 2 Protocols
- Radio Resource Control
- LTE-Advanced
- Lower Layer Procedures

LTE Voice - VoLTE

(Study Time: 24 Hours)

This course provides a detailed technical description of the currently specified methods of offering a VoIP service using LTE and the IP Multimedia Subsystem.

Course Modules:

- LTE Overview
- Evolved Packet Core Data
- Transport in the EPC
- Major Protocols
- EPC Operation
- Release 9 and Beyond

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Other Technologies

LTE & 5G Security

(Study Time: 32 Hours)

This course provides a detailed overview of the security environment developed for LTE and 5G networks in both the access and core network domains. It then describes the improvements made in 5G security for both Non-standalone and Standalone Modes.

Course Modules:

- LTE Security Architecture
- Authentication and Key Agreement
- Evolution to 5G
- 5G Non-Standalone Mode Security

eSIM Engineering

(Study Time: 24 Hours)

This course is a detailed technical description of eSIM technology and the new remote SIM provisioning specifications from GSMA covering M2M and Consumer applications.

Course Modules:

- Introduction to eSIM
- GSMA Consumer eSIM Specification
- GSMA M2M eSIM Specification
- GSMA Consumer eSIM Specification Enhancements
- The Future of eSIM

GSM-R Engineering Overview

(Study Time: 11 Hours)

This detailed course provides network engineers with an in-depth study that covers all principles of GSM-R networks and operation.

Course Modules:

- Introduction to GSM & GSM-R Networks
- GSM-R Network Architecture
- GSM-R Identities
- GSM-R Functionality
- GSM-R Coverage

ERTMS/ETCS for Radio Engineers

(Study Time: 32 Hours)

The European Railway Traffic Management System (ERTMS) is a European system to create a 'digital railway'. ETRMS is a major project but is only part of the digitalization process.

Course Modules:

- ERTMS Standards and Legislation
- 2 Basic System Description
- System Architecture
- ERTMS Operating Modes
- ERTMS/ETCS Protocols
- Circuit Switched Signalling
- Circuit Switched Connections
- GPRS for ETCS
- The GPRS Air Interface
- GPRS Procedures
- Transmission through the Network
- Radio Network Optimization

Future Railway Mobile Communications System (FRMCS)

(Study Time: 24 Hours)

This FRMCS course looks at the documents published by the UIC to gain an understanding of the requirements of a future communications system. The course analyses the current spectrum options which leads to an overview of how 5G could be a potential candidate for FRMCS

Course Modules:

- FRMCS – An Introduction
- FRMCS Requirements
- Spectrum Issues
- On-board System Architecture
- 4G –LTE
- 5G
- IMS
- Mission Critical Push to Talk
- Mission Critical Video
- Mission Critical Data

Microwave Link Planning

(Study Time: 32 Hours)

The course covers all of the essential aspects of planning point-to-point microwave link systems, from conception to commissioning.

Course Modules:

- Fixed Link Radio Technology
- Availability, Performance and Reliability Objectives
- Spectrum Management
- Feeders and Antennas
- Path Profiling
- Power Budgets
- Fading
- Diversity Systems
- Frequency Assignment and Interference Management

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Telecoms Business Courses

Available 2022

Business Finance for Non-Finance Specialists

(Study Time: 24 Hours)

Providing a comprehensive foundation in business finance – covering all the major areas needed to be a fully-functioning member of the mid-senior management team. It is ideal for current or aspiring managers, specialists with financial responsibility, or identified talent / graduates.

Course Modules:

- The Financial Cycle and Reporting
- Section 2 KPIs, Ratios and Financial Analysis
- Section 3 Financial Control, Budgets and Evaluating Initiatives / Projects

Developing and Communicating Compelling Customer Propositions

(Study Time: 24 Hours)

Covering all the key elements needed to develop a sustainable business model that is tightly aligned with customer requirements, gets the right information in front of the right customers in an engaging and compelling way, and supports the overall strategy by delivering sustainable competitive advantage

Course Modules:

- Creating Compelling Customer Propositions
- Communicating Compelling Customer Propositions
- Sales and Business Development

Strategy (with a Telecoms Focus)

(Study Time: 24 Hours)

This course looks at each component of strategy in turn, with the decision-making process at the heart of a much more extensive set of activities needed to maximise the impact of good strategy.

Course Modules:

- Understanding Strategy, Industry and Business Dynamics
- Analysing the Market; Developing Strategy & Competitive Advantage, Strategy Execution, KPIS & OKRs
- 3 Key Performance Enablers

Evaluating & Optimising the Business Model(s)

(Study Time: 24 Hours)

In this course, we deconstruct the business model in order to fully understand its component parts before looking at how those parts can be optimally configured in order to maximise value creation and competitive advantage.

Course Modules:

- Definitions and Components of a Business Model
- Business Models – Options, Assessment and Development

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About Wray Castle

We empower the global telecoms world by developing the specialist knowledge, skills and competencies organisations need to build, maintain, optimise and operate the cutting-edge communications networks of today and tomorrow that support national critical infrastructure.

Trusted by the global telecoms industry since 1958, we've helped upskill over 300,000 industry professionals from over 85 countries worldwide. Our learners come from many major mobile and fixed operators, vendors, regulators, consultants, rail operators, energy suppliers and government organisations.

Our Expertise

Our team of highly experienced specialist course developers and instructors come with decades of experience from within the industry and as specialist technical trainers. We support learners at all stages of their career from new entrants looking for a thorough grounding in industry to experienced engineers needing to get up to speed on the latest network technologies.

Each course features continuously updated content, our courses cover all the major global communications technologies including:

- 5G Technology
- Essential Technologies
- LTE/4G
- UMTS & HSPA
- GSM & GPRS
- IMS & SIP
- Radio Engineering
- OpenRAN
- Professional Personal Radio
- IP Engineering
- Network Virtualisation
- Telecoms Business

Innovative, flexible learning solutions

Our courses are designed to deliver knowledge in an engaging and enjoyable way that inspires the learner, reinforces knowledge and promotes life-long learning. Our innovative, flexible learning solutions include:

- **Instructor-led Classroom** - We use a range of learning techniques to bring your programme to life including exercises, demonstrations, and role-playing.
- **Live Virtual Classroom** - Live online classes deliver the same interactive, engaging learning experience as the face-to-face classroom training.
- **On-Demand Online Learning** - Learn online, anytime, with our self-study courses, each course features illustrated course books, videos, tests and full tutor support.
- **Enterprise Academy** – Designed and customised for each client, our Academies make best-in-class blended live and on-demand learning available to all employees within an organisation.

We help empower employees to reach their potential and deliver a true return on your training investment.