WM3G7-15 Digital Communication and Networking

26/27

Department
WMG
Level
Undergraduate Level 3
Module leader
Wael Alsaafin
Credit value
15
Module duration
14 weeks
Assessment
100% coursework
Study locations
University of Warwick main campus, Coventry Primary
Distance or Online Delivery

Description

Introductory description

This module focuses on legacy systems, current architecture, and emerging technologies. The students will be equipped with the knowledge and skills necessary to solve communication problems and evaluate communication systems performance. The module will explain analogue and digital communication systems components, layers of the Open Systems Interconnection (OSI) model and Transmission Control Protocol/Internet Protocol (TCP/IP) network models used in the internet. In-vehicle networks such as CAN, LIN and V2X communication will be explained. Recent technologies, for example: network security and cloud computing will be introduced as well.

This module is linked with C1, C2, C3, C4, C6, C10, C16, and C17 of the AHEP 4.
LO1 : C1, C2, C3, C16.
LO2 : C2, C6.
LO3 : C2, C4, C17.
LO4 : C4, C10, C16.

Module web page

Module aims

This module aims to introduce students to communication systems and concentrate on building a firm foundation for understanding data communications, computer networks., and automotive networks. It provides students with a good understanding of practical communication systems and develops the ability to analyse and design simple examples of such systems.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Communication Systems

- Fundamentals of communication systems: Signal-to-noise ratio (SNR), channel bandwidth & rate of communication, the electromagnetic frequency domain and noise in communications
- Analogue communication
- Digital communication: sampling, quantization, line coding, digital modulation and effect of noise
- Multiplexing, demultiplexing and multiple access: TDMA/ FDMA/ CDMA
  Computer Networks
- Fundamentals of computer networks
- The physical layer / data link layer: wired/wireless mediums, circuit and packet switching and error detection
- Network layer: routing algorithms
- Transport layer / application layer: TCP/UDP protocol, DNS and FTP
  Vehicle Networks:
- In-vehicle networks like CAN network, LIN, and FlexRay; V2X communication; Advanced Driver Assistance Systems (ADAS) systems.
- Error handling techniques
  Advanced topics such as network security, cloud computing.

Learning outcomes

By the end of the module, students should be able to:

- Demonstrate knowledge of concepts, mathematical tools and theories related to communication methods, such as analogue communication, digital communication, computer networks. (AHEP: 4-C1, C2, C3, C16)
- Explain networking protocols and their hierarchical relationship - hardware and software. [AHEP: 4-C2, C6]
- Identify different network protocols currently implemented in data communication networks; in-vehicle networks; V2X communication. [AHEP: 4-C2, C4, C17]
- Critically reflect on technical advancements in modern technologies such as network security. [AHEP: 4-C4, C10, C16]

Indicative reading list

Reading lists can be found in Talis

Specific reading list for the module

Subject specific skills

- Translate conceptual ideas or technical requirements into developmental outcomes or operational designs or specifications for systems or components to solve electrical/electronic challenges (S1 in ST0024) or process control systems (S1 in ST0023).
- Select, use and apply approved problem-solving methods to solve complex problems and determine appropriate solutions (S2 in ST0023 and ST0024).
- Interpret and produce technical documentation such as schematic and circuit diagrams, (S4 in ST0023), simulation models (S4 in ST0024).
- Identify resources, such as digital tools or technologies, human, equipment, materials or data, to complete design and development projects or programmes of work (S9 in ST0024)
- Ensure that all instrumentation has been correctly configured and calibrated before use (S11 in ST0023).
- Identify areas for improvement and lead continuous improvement activities (S12 in ST0023).
- Identify areas for improvement and lead continuous improvement activities in the operation and performance of the system or component (S14 in ST0024).
- Interpret key performance indicators and utilise improvement techniques or processes to improve efficiency and effectiveness (S14 in ST0023).

Transferable skills

Technology literacy.
Teamwork.
Critical thinking.
Problem-solving.
Simulation and analysis.
Report writing.

Study

Study time

Type	Required
Lectures	12 sessions of 1 hour (8%)
Seminars	9 sessions of 1 hour (6%)
Practical classes	3 sessions of 1 hour (2%)
Total	150 hours

Type	Required
Online learning (scheduled sessions)	6 sessions of 1 hour (4%)
Online learning (independent)	10 sessions of 1 hour (7%)
Other activity	5 hours (3%)
Private study	45 hours (30%)
Assessment	60 hours (40%)
Total	150 hours

Private study description

Self-guided study: revision on module contents, solution of additional seminar-type questions, video tutorials and supplementary materials.
Study and use of simulation software.
Online forum and discussion (asynchronous).

Other activity description

On-line support / consultancy during the off-campus work on assessments.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A

	Weighting	Study time	Eligible for self-certification
Assessment component			
Assignment 1	40%	24 hours	Yes (extension)

Individual written report on communication systems and computer networks.
Students can work in groups of 2 or 3, but each student must submit their own report.

Reassessment component	
Assignment 1	No

Individual written report on communication systems and computer networks.

	Weighting	Study time	Eligible for self-certification

Students can work in groups of 2 or 3, but each student must submit their own report.

Assessment component

Assignment 2	60%	36 hours	Yes (extension)

Individual written report on vehicle networks and advanced topics such as network security, Students can work in groups of 2 or 3, but each student must submit their own report.

Reassessment component

Assignment 2	No

Individual written report on vehicle networks and advanced topics such as network security, Students can work in groups of 2 or 3, but each student must submit their own report.

Feedback on assessment

Formative Feedback:

- verbal formative feedback given during seminar/tutorial sessions,

Summative Feedback:

- written individual feedback on the assignment 1 report,
- written individual feedback on the assignment 2 report.

Availability

Courses

This module is Core for:

- Year 3 of UWMS-H7C3 Undergraduate Applied Professional Engineering (Control/Technical Support Engineer)
- Year 3 of UWMS-H7C2 Undergraduate Applied Professional Engineering (Electrical/Electronic Support Engineer)
- Year 3 of DWMS-H7C6 Undergraduate Applied Professional Engineering (Electrical/Electronic Support Engineer) (Degree Apprenticeship)
- Professional Applied Engineering