Module Specification

Module Summary Information

1	**Module Title**	Smart Systems
2	**Module Credits**	20
3	**Module Level**	5
4	**Module Code**	CMP5324

5	**Module Overview**

The Internet of Things (IoT) is a system of connected computing devices, electromechanical, digital machines, objects with the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. It is estimated that by 2020 there will approx. 50 billion IoT devices. This module will provide knowledge and skills for the research, synthesis and evaluation of solutions incorporating internet communication systems and devices that can be used to make informed and wise decisions.

In this module you will build on the foundations of networking, maths, programming, and computer hardware modules you studied during level 4 to further investigate and apply relevant techniques. It will complement and support your other level 5 modules in particular the HCI, Project, networking, infrastructure and virtualisation content.

The module consists of:

- Subject specific lectures/laboratory sessions introducing you to the knowledge and skills relevant to smart systems domain including internet based sensors and internet of things platforms and protocols.
- Practical laboratory sessions will provide you an opportunity to both apply the knowledge gained through pre/post learning activities for both lectures and tutorials, and also for you to investigate and develop the necessary skills to solve real-world problem-based scenarios around sensing and monitoring.
- Project based group learning activities, supported by academic staff.

Relationship to programme philosophy:

This module provides an opportunity for the student to develop knowledge and skills, which will contribute to the acquisition of key BCU graduate attributes; creative problem solvers, global outlook, enterprising, professional and work ready. In the context of computing and data communication, this means an ability to respond to a critical brief to find practical solutions to problems; evaluate and respond to the opportunities and challenges of interdisciplinary approaches to the realisation of a task; respond flexibly and imaginatively to a set, or group-determined brief within a fixed timescale.

6	Indicative Content

- **Sensors** are devices that detect and respond to some type of input from the physical environment. These inputs are captured to understand the behaviour of the surrounding (i.e. this could be light, heat, motion, moisture, pressure).These sensors are always used with other electronics to provide the required functionality.

- **Smart Hardware Infrastructure** can be defined as the physical components that can be used in the entire smart systems life cycle. The most common being the electrical, electronic and mechanical components at the end-device, network devices and the backend devices (i.e. servers, data storage devices).

- **IoT Connectivity Technologies** are set of communications protocols that are responsible to transmit the collected data through sensors and electronics boards to remote or local servers for further processing. This can be carried out via different wireless communication protocols such Smart Bluetooth, Zigbee and Zwave for short range or LPWAN technologies or Cellular- based technologies for long range . In addition, wired communications can be used to transmit data under certain system configurations.

- **Edge/Cloud Computing services** are all the existing solutions and resources that can be used to provide services to the end-users in an efficient and effective way. This service includes device registrations, session management and device firmware update.

- **Data Analytics algorithms** - are set of approaches and techniques that can be used to realize value and create insights and trends from the huge volumes of data generated by connected devices and sensors. This will be support the decision making process for the business owners.

- **Data Visualisation and Reporting** are business intelligent tools that displays the current status of metrics and key performance indicators (KPIs) for an enterprise. Dashboards consolidate and arrange numbers, metrics and sometimes performance scorecards on a single screen used for reporting.

- **Security aspects** are various cyber security issues related to smart systems that need to be identified and treated .There are concerns about frauds exploiting security vulnerabilities in smart systems. This will provide the latest security solutions, approach and frameworks that needed to eliminate or mitigate the security risks.
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- **Business models for smart systems** are group of business concepts that help the service or product owners to commercialise their commodities through innovative approaches. This will describe how the business is used by its customers and partners. This will provide example of business models for application domains such as industrial 4.0 , Smart Health and Smart cities.

7	Module Learning Outcomes On successful completion of the module, students will be able to:	
	1	Demonstrate knowledge of the fundamental theoretical concepts underpins smart systems.
	2	Research and Compare various smart systems technologies for given industrial application.
	3	Apply appropriate approach and techniques to transform data into meaningful information.
	4	Develop and evaluate, an appropriate smart business solution to provide a required output.

8	Module Assessment			
Learning Outcome				
		Coursework	Exam	In-Person (Demo)
1 - 4		x		

9	Breakdown Learning and Teaching Activities	
Learning Activities		Hours
Scheduled Learning (SL) includes lectures, practical classes and workshops, peer group learning, Graduate+, as specified in timetable		48
Directed Learning (DL) includes placements, work-based learning, external visits, on-line activity, Graduate+, peer learning, as directed on VLE		102
Private Study (PS) includes preparation for exams		50
Total Study Hours:		200