WM392-15 Real Time Operating Systems

24/25

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

Description

Introductory description

In the era of digitization, the computing devices are expected to perform complex and critical tasks. The operating systems is the fundamental software in computer systems that support the devices to perform tasks so it is very important that operating systems should be stable and efficient.

Module aims

This module aims to cover the core concepts of operating systems including process, threads, scheduling, deadlocks, memory systems and file systems. The fundamental concepts related to time and resource limitation in real time operating systems will also be discussed. A brief introduction to real time programming language will be covered.

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.

- Operating system functions
- The evolution of operating Systems
- Security Issues
- Processes and threads
- Process scheduling and state
- Inter-process communication
- Threads vs. processes
- Kernel vs user threads
- Concurrency and synchronization
- Scheduling:
- CPU Scheduler
- Scheduling criteria and algorithms
- Thread scheduling
- Deadlock:
- Race condition
- Critical section
- Semaphores
- Memory system and virtual memory
- Swapping
- Paging
- Segmentation
- File systems, disk scheduling and I/O
- Disk scheduling
- Design and analysis of real time system software
- Reliability and fault tolerance
- Real time communication
- Real time systems for multiprocessor systems
- Introduction to AUTOSAR

Learning outcomes

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

- Describe the mechanisms of operating system to handle processes, threads, scheduling and communication.
- Know the structure and organization of the file system and analyse the components for concurrency management.
- Analyse the concepts related to deadlocks and mutual exclusion with time and resource limitations.
- Use tools and methodologies for supporting time critical computing systems.

Indicative reading list

- Wang, K. C., “ Embedded and real-time operating systems”, Springer 2017, ISBN: 9783319515175

- A. Holt, “ Embedded operating systems; a practical approach”, Springer 2018, ISBN : 978 319729770
- C. Naresh, “Principles of operating systems”, Oxford University Press, 2015, ISBN : 9780198082873.
- J. Schauffele, “Automotive software engineering; principles, processes, methods and tools”, SAE International, 2005, ISBN: 0768014905.

Subject specific skills

students will learn operating system (OS) architectures, understand time critical processes and scheduling issues within OS.

Transferable skills

Students should be able to demonstrate:

Applies analytical and critical thinking skills to systematically develop, analyse and apply structured problem solving techniques to complex systems and situations.

High level of critical thinking and digital literacy.

Study

Study time

Type	Required
Lectures	20 sessions of 1 hour (17%)
Seminars	6 sessions of 1 hour (5%)
Practical classes	6 sessions of 1 hour (5%)
Work-based learning	22 sessions of 1 hour (19%)
Online learning (independent)	10 sessions of 1 hour (8%)
Private study	54 hours (46%)
Total	118 hours

Private study description

Self-study including:

- Pre-block reference videos or reading given on Moodle.
- Post-block activity exercises on Moodle.
- Online forum for discussing queries with course peers and tutor.
- Distance learning support using technology enhanced learning.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A1

	Weighting	Study time	Eligible for self-certification
Solution developments and individual project	100%	32 hours	Yes (extension)

This assessment includes a written report (2500) and plus programming development (a half of the assessment time required).

- Investigation and analysis of Real-Time applications based on the Coursework.
- Find solutions for the given tasks.
- Design and implementation of functionalities for Real-Time applications.

Feedback on assessment

Feedback will be given as appropriate to the assessment type:
– verbal formative feedback on lab activities related to in-module assessment.
– written summative feedback on post module assessments.

Availability

Courses

This module is Core for:

- Year 3 of DWMS-H654 Undergraduate Digital and Technology Solutions (Software Engineering) (Degree Apprenticeship)