



Department of Electrical Engineering

College of Engineering

Salahaddin University-Erbil

Subject: Real-Time Embedded Systems

Course Book - (2021-2022)

Lecturer's name: Qahhar Muhammad Qadir BSc, MSc, PhD

Academic Year: 2021/2022 (Semester 2)

Course Book

1. Course name	Real-Time Embedded Systems
2. Lecturer in charge	Qahhar Muhammad Qadir
3. Department/ College	Electrical/Engineering
4. Contact	e-mail: qahhar.qadir@su.edu.krd Tel: (optional)
5. Time (in hours) per week	Theory: 3 Practical: 0
6. Office hours	Sunday 9-11am
7. Course code	
8. Teacher's academic profile	https://academics.su.edu.krd/qahhar.qadir
9. Keywords	Hard and soft time systems, scheduling, RTOS
<p>10. Course overview: The course introduces the concepts of real-time systems from the user and designer viewpoint. The requirements, design, implementation, and basic properties of real-time application software are described with an overview of system software. Related topics such as interrupts, concurrent task synchronization, sharing resources, and software reliability are discussed.</p>	
<p>11. Course objective: Upon successful completion of the course, the students are expected to have a thorough understanding of the particular challenges posed by real-time systems, particularly those for embedded and pervasive applications. Topics include the hardware and software co-development methodology, scheduling, tasks, semaphores, message queues, kernel objects, RTOS services, handling exceptions and interrupts, timer services, I/O concepts, memory management, and inter-task synchronization and communication.</p>	
<p>12. Student's obligation Students are expected to attend classes, do the assignments and submit them by the due date, sit for the exams and do other required tasks given by the instructor. In particular</p> <ul style="list-style-type: none"> • Regular attendance is required according to the university rules. • The use of mobile phone during the class is prohibited. • Only the students who are officially enrolled can attend the class, guests and children are not admitted. • Daily participation and conducting assignments are required. 	
<p>13. Forms of teaching The teaching strategies practised in this course include regular weekly lectures using PowerPoint slides, videos, simulation and other supporting materials. All materials are uploaded to Google Drive.</p>	
<p>14. Assessment scheme The performance of the participants is assessed in many ways. Daily participation and activities, assignments/projects, critical reading and exams are used to evaluate them in</p>	

regular basis. Assignments and critical reading tasks are done by the semester week prior the final examination. Exams (both midterms & final) will be scheduled by the examination committee in the department.

Below is the grading scheme of the course:

Midterm	20%
Assignment	20%
Class activities	10%
Final Exam	50%

15. Student learning outcome:

Upon successful completion of this course, students will be able to

1. Distinguish between the hard and soft real-time systems,
2. Understand the theoretical concepts of real-time embedded systems
3. Design factors of real-time embedded systems

16. Course Reading List and References:

■ **Textbook:** Real-Time Embedded Components and Systems with Linux and RTOS, 2nd Edition, Sam Siewert and John Pratt, October 2015.

■ Useful references: Internet

■ Magazines and review (internet): Will be passed to used by the instructor

17. The Topics:

Lecturer's name

Week 1: Introduction to RTES
 Week 2: System resources
 Week 3: Processing
 Week 4: Resources
 Week 5: Memory
 Week 6: Multiresource Services
 Week7: Soft Real-Time Services
 Week 8: Embedded System Components
 Week 9: Traditional Hard Real-Time Operating Systems
 Week 10: Open Source Real-Time Operating Systems
 Week 11: Integrating Embedded Linux into Real-Time Systems
 Week 12: Debugging Components
 Week 13: Performance Tuning
 Week 14: Review
 Week 15: Final Exam

Qahhar Muhammad
Qadir

18. Practical Topics (If there is any)

19. Examinations:

1. **Compositional:** In this type of exam the questions usually starts with Explain how, What are the reasons for...?, Why...?, How....?
 With their typical answers

For example:

Q: What is RTEM. Support your answer with an example that is commercially available.

A: As discussed in the class.

20. Extra notes:

None

21. Peer review

Will be given when are necessary.