Philadelphia University
Faculty of Engineering & Technology
Department of Computer Engineering

Summer Semester, 2019/2020

Course Syllabus

Course Title: REAL-TIME SYSTEMS		**Course code:** 0630512	
Course Level: 5th Year		**Course prerequisite(s):** 0630414	
Class Time: 4:00-5:00 pm		**Credit hours:** 3	

Academic Staff Specific

Name	Rank	Office No.	Office Hours	E-mail Address
Kasim Al-Aubidy	Prof.	**812**	13:15-14:15 Weekly	*kma@philadelphia.edu.jo*

Course description:
Basic introduction to real-time systems design, development and implementation. It includes; hardware design of input/output interface between a microcomputer or a microcontroller and a plant, real-time algorithms design and realization, stability of microcomputer-based systems, real-time operating systems, and other related topics.

Course objectives:
The main objective of this course is to cover the principles and design methods of real-time computer systems. It covers the interfacing techniques and microprocessor system realization. The principles of real-time operating systems and real-time software system will be covered in this course.

Course components
- **Books (title , author (s), publisher, year of publication)**

  1. Real-Time Computer Control: an Introduction, By: Stuart Bennett, Prentice-Hall, 2nd edition, 1994.
  2. Real-Time Systems: Design Principles for Distributed Embedded Applications, By Hermann Kopetz, Springer-Verlag New York, USA, 2011, ISBN: 1441982361,
- **Support material (s) (vcs, acs, etc).**
- **Study guide (s) (if applicable)**
- **Homework and laboratory guide (s) if (applicable).**

Teaching methods:
Lectures, discussion groups, tutorials, problem solving, debates, etc.

Learning outcomes: upon completing this course, the student should have: -
- Knowledge and understanding: Understanding principles of embedded systems design; be aware of architectures and behaviors of embedded systems.

- Cognitive skills (thinking and analysis).

- Communication skills (personal and academic).

- Practical and subject specific skills (Transferable Skills).

Course Intended Learning Outcomes									
A - Knowledge and Understanding									
A1.	A2.	A3.	A4.	A5.	A6.	A7.	A8.		
■	■	■			■		■		
B - Intellectual Skills									
B1.	B2.	B3.	B4.	B5.	B6.	B7.	B8.	B9.	
■		■	■		■		■		
C - Practical Skills									
C1.	C2.	C3.	C4.	C5.	C6.	C7.	C8.	C9.	C10.
■			■		■			■	
D - Transferable Skills									
D1.	D2.	D3.	D4.	D5.	D6.	D7.			
■		■			■				

Assessment instruments:

- **Short reports and presentations**: Reading related to current topic will be assigned every week. Assignments and other Homework (HW) will be given throughout the semester, focusing on the concepts learned from these readings.
- **Assignment:** TWO to THREE Assignments will be offered (dates TBD).
- **Project:** Project is an essential part of this course. Assessment will be based on 3 phases: System Specification, System Design, Hardware and Software Implementation with Project Demonstration. Detailed topics and schedule will be announced in due course.
- **Mid Exam:** 30 marks
- **Final examination**: 50 marks

Allocation of Marks	
Assessment Instruments	**Mark**
Project & Assignments	**20%**
Mid Exam	**30%**
Final Examination:	**50%**
Total	**100%**

Documentation and academic honesty:
- Documentation style (with illustrative examples)
- Protection by copyright
- Avoiding plagiarism.
- **Ethics and Disability Act:**
  - Students may consult with one another on solutions, but copying another student's code is strictly prohibited.
  - Students should write their own code. Using code found on books or internet is prohibited.
  - The Instructor follows general university "Academic Dishonesty/Cheating Policy".

Course academic calendar:

week	Basic and support material to be covered	Homework/ Quizzes and their due dates
1	- An introduction to real-time computer systems. - Elements of a real-time microcontroller-based system.	
2	- Classification of RTS, Time constraints, Classification of programs. - Computer Control concepts; Sequence control, DDC, PID control, Adaptive control, Supervisory control,	Project Selection
3	- Centralized control, Hierarchical systems, Distributed systems. - Hardware requirements for real-time systems: Analog I/O interfacing.	Assignment 1
4	- Hardware requirements for real-time systems: Digital and Pulse I/O interfacing. - Data Acquisition and Data Distribution system design.	Project (Ph1)
5	- Implementation of real-time algorithms. - Realization of real-time algorithms using single processors or more.	
6	- Stability analysis of real-time systems.	Assignment 2
7	- Software design of real-time systems.	Project (Ph2)
8	- Operating systems for real-time applications: Basic features of RTOSs,	Project (Ph3)
9	- Final submission of Projects.	Final Exam

Expected workload:
On average students need to spend 2 hours of study and preparation for each 60-minute class/tutorial.

Attendance policy:
Absence from classes and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse acceptable to and approved by the Dean of the relevant college/faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.
The student is responsible for all assignments on a weekly basis.
No make-up will be given for missed quizzes, tests or assignments, unless a case is made in advance with Instructor's approval.

Course References:

Books:
1. D. Ibrahim, Microcontroller Based Applied Digital Control, John Wiley & Sons Ltd, UK, 2006, ISBN: 0-470-86335-8
2. J.W.S. LIN, Real-Time Systems, Prentice Hall, 2000.
3. N. NISSANKE, Real-Time Systems, Prentice Hall, 1997.
4. R.J.A. BUHR & D.L. BAILEY, An Introduction to Real-Time Systems, Prentice Hall, 1999.
5. S. BENNETT & G.S. VIRK, Computer Control of Real-Time Processes, IEE 1990.
6. S. HEATH, Embedded Systems Design, Newness 1999.
7. W. VALVANO, Embedded Microcomputer Systems: Real-Time Interfacing, Brooks-Cole Publisher, 2000.
8. J. Cooling, Software Engineering for Real-Time Systems, Addison Wesley, UK 2003. www.pearsopneduc.com

Journals

Websites