



Course Specification

Course Name: [Real Time Systems]

Course Code: [IT412]

I. Basic Course Information

Major or minor element of program: Major
Department offering the course: [Information Technology Department]

Academic level: [400 Level]
Semester in which course is offered: [Second (Spring) Semester]
Course pre-requisite(s): [IT311: Computer Architecture]

Credit Hours: 3
Contact Hours Through:

Lecture	Tutorial*	Practical*	Total
2.5	[1.5]	[0.0]	4.0

* 1.5 hours for **either** Tutorial or Practical

Approval date of course specification: [January 2015]

II. Overall Aims of Course

[Recent developments of network services and many forms of multimedia computing, together with the increased use of commercial products carrying embedded systems (such as automobiles, cell phones, etc.) have raised awareness for real-time issues which were traditionally confined to areas of control systems and avionics.

This course is designed to provide students with the theoretical foundations for the design and synthesis of real-time systems (RTS) and applications; it also presents criteria used to evaluate and validate such systems. The course covers scheduling and validation of schedules (schedulability analysis) in detail. Issues in real-time communication are addressed including scheduling, architectures and protocols.]

III. Program ILOs covered by course

Program Intended Learning Outcomes (By Code)			
Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
[K5,K7,K14,K23]	[I2,I15,I16]	[P9,P13]	[G1,G2,G6]



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IV. Intended Learning Outcomes of Course (ILOs)

a. Knowledge and Understanding

On completing the course, students should be able to:

- K.1 Recognize the various concepts of time that arise in hard & soft real-time applications.
- K.2 List Real-time scheduling algorithms and resource access control protocols for single-processor and multi-processor systems..
- K.3 Define the negative effects of resource contention in single-processor and multi-processor systems.
- K.4 Recognize the problems that arise in real-time communication and how to modify network protocols to be suitable for real-time communication.]

b. Intellectual/Cognitive Skills

On completing the course, students should be able to:

- I.1 Recognize and formulate the hard and soft timing requirements of a RTS.
- I.2 Rate different real-time scheduling algorithms and resource access control protocols.
- I.3 Construct schedules using a variety of static and dynamic scheduling mechanisms suitable for soft and hard RTS.]

c. Practical/Professional Skills

On completing the course, students should be able to:

- P.1 Demonstrate correctly and precisely reason about times, events, and sources of error arising in real-time applications.
- P.2 Apply a variety of static and dynamic scheduling mechanisms suitable for soft and hard real-time systems.
- P.3 Validate real-time systems for correctness.]

d. General and Transferable Skills

On completing the course, students should be able to:

- G.1 Gather, synthesize and organize material from various sources.
- G.2 Improve report writing skills.
- G.3 Improve presentation skills.
- G.4 Improve team working.]

V. Course MatrixContents

	Main Topics / Chapters	Duration (Weeks)	Course ILOs Covered by Topic (By ILO Code)			
			K & U	I.S.	P.S.	G.S.
1-	[Introduction to Typical Real-time Applications: Digital Control - High Level Controls - Signal Processing in a Radar System - Real-time Databases - Multimedia Applications]	[3]	[K1]	[I1]	[P1]	[]
2-	[Features of the Reference Model]	[1]	[]	[]	[]	[]
3-	[Common Approaches to Real-time Scheduling on a Single Processor]	[1]	[K2]	[]	[P2]	[]
4-	[Multiprocessor Scheduling Techniques]	[1]	[K2]	[I3]	[P2]	[]



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5-	[Resource Access Control Protocols]	[1]	[K2]	[I2]	[]	[]
6-	[Multiprocessor Resource Access Control Protocol]	[1]	[K2,K3]	[I2]	[]	[]
7-	[Real-time Communication]	[2]	[K4]	[]	[P3]	[]
8-	[Students Presentations on Selected Papers and Topics]	[3]	[]	[]	[]	[All]
	Net Teaching Weeks	13				

VI. Course Weekly Detailed Topics / hours / ILOs

Week No.	Sub-Topics	Total Hours	Contact Hours	
			Theoretical Hours	Practical Hours*
1	[Introduction to Real-Time Systems]	[2.5]	[2.5]	
2	[Typical Real-Time Applications]	[4]	[2.5]	[1.5]
3	[Real-Time Terms & Definitions]	[4]	[2.5]	[1.5]
4	[A Reference Model of Real-Time Systems]	[4]	[2.5]	[1.5]
5	[Real-Time Scheduling I]	[4]	[2.5]	[1.5]
6	[Real-Time Scheduling II]	[4]	[2.5]	[1.5]
7	Midterm Exam			
8	[Multiprocessor Scheduling]	[4]	[2.5]	[1.5]
9	[Resource Access Control Protocols]	[4]	[2.5]	[1.5]
10	[Multiprocessor Resource Access Control Protocol (MPCP)]	[4]	[2.5]	[1.5]
11	[Real-Time Communication I]	[4]	[2.5]	[1.5]
12	[Real-Time Communication II]	[4]	[2.5]	[1.5]
13	[Students Presentations on Selected Papers and Topics]	[4]	[2.5]	[1.5]
14	[Students Presentations on Selected Papers and Topics]	[4]	[2.5]	[1.5]
15	Final Exam			
Total Teaching Hours		51	33	18

* No Practical/Tutorial during the first week of the semester



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VII. Teaching and Learning Methods

Teaching/Learning Method	Selected Method	Course ILOs Covered by Method (By ILO Code)			
		K & U	Intellectual Skills	Professional Skills	General Skills
Lectures & Seminars	<input checked="" type="checkbox"/>	All	I1		
Tutorials	<input checked="" type="checkbox"/>	K1, K2	I2	P2,P3	
Computer lab Sessions	<input type="checkbox"/>				
Practical lab Work	<input type="checkbox"/>				
Reading Materials	<input checked="" type="checkbox"/>	K1K2	I2	P1	G1
Web-site Searches	<input checked="" type="checkbox"/>	K4			G1
Research & Reporting	<input type="checkbox"/>				
Problem Solving / Problem-based Learning	<input type="checkbox"/>				
Projects	<input type="checkbox"/>				
Independent Work	<input type="checkbox"/>				
Group Work	<input checked="" type="checkbox"/>	K4	I3	P2	G2,G4
Case Studies	<input type="checkbox"/>				
Presentations	<input checked="" type="checkbox"/>				G1,G3
Simulation Analysis	<input type="checkbox"/>				
Others (Specify):	<input type="checkbox"/>				

VIII. Assessment Methods, Schedule and Grade Distribution

Assessment Method	Selected Method	Course ILOs Covered by Method (By ILO Code)				Assessment Weight / Percentage	Week No.
		K & U	I.S.	P.S.	G.S.		
Midterm Exam	<input checked="" type="checkbox"/>	All	I1,I3	P2,P3		15%	7
Final Exam	<input checked="" type="checkbox"/>	All	I1,I3	P2,P3		60%	15
Quizzes	<input checked="" type="checkbox"/>	K1				15%	9
Course Work	<input type="checkbox"/>						
Report Writing	<input checked="" type="checkbox"/>		I2	P1	G1,G2,G4	5%	10
Case Study Analysis	<input type="checkbox"/>						
Oral Presentations	<input checked="" type="checkbox"/>				G3,G4	5%	12
Practical	<input type="checkbox"/>						
Group Project	<input type="checkbox"/>						
Individual Project	<input type="checkbox"/>						
Others (Specify):	<input type="checkbox"/>						

IX. List of References



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Essential Text Books	<ul style="list-style-type: none">• [Jane W.S. Liu, Real-Time Systems, Prentice Hall, 2000.]
Course notes	<ul style="list-style-type: none">• [Power Point Presentations distributed electronically• Whiteboard scribble]
Recommended books	<ul style="list-style-type: none">• [C.M. Krishna and K.G. Shin, Real-Time Systems, McGraw-Hill, 1997.• Alan Shaw, Real-Time Systems and Software, John Wiley & Sons, Inc. 2001.• Alan Burns & Andy Wellings, Real-Time Systems & Programming Languages, Third Edition, Addison Wesley, 2001.• Bill Gallmeister, POSIX.4: Programming for the Real-World, O'Reilly and Associates, 1995.]
Periodicals, Web sites, etc ...	<ul style="list-style-type: none">• [http://www.uppaal.com/• http://www.cse.wustl.edu/~lu/cs520s/520_reading.htm]

X. Facilities required for teaching and learning

<ul style="list-style-type: none">• [Data Show.• Computers and internet access for students.]

Course coordinator:[Ass.Prof. Iman El Azab]

Head of Department:Prof. Hesham El Mahdy

Date: [January 2015]