

Course Specification

(Postgraduate Programs)

Course Title: System Level Design for Embedded Systems

Course Code: CE6300

Program: Master of Science in Computer Engineering

Department: Computer and Network Engineering

College: College of Computing

Institution: Umm Al-Qura University

Version: 1.0

Last Revision Date: 12/4/2025



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A. General information about the course:

1. Course Identification:

1. Credit hours: (3)				
2. Course type				
A.	<input type="checkbox"/> University	<input type="checkbox"/> College	<input type="checkbox"/> Department	<input checked="" type="checkbox"/> Track
B.	<input checked="" type="checkbox"/> Required in Embedded Systems and IoT Track		<input checked="" type="checkbox"/> Elective in the other tracks	
3. Level/year at which this course is offered: (Level 3)				
4. Course General Description:				
<p>This course provides a comprehensive overview of system-level design for embedded systems, blending both theoretical and practical aspects. Students will explore system design methodologies, modeling techniques, and the synthesis of software and hardware components. The course highlights verification techniques and introduces advanced, state-of-the-art tools used in system-level design as documented in the latest literature. By the end of the course, students will develop a holistic understanding of embedded system design and will be prepared to implement these concepts in practical scenarios.</p>				
5. Pre-requirements for this course (if any):				
Embedded Systems				
6. Co-requirements for this course (if any):				
None				
7. Course Main Objective(s):				
<ol style="list-style-type: none"> 1. To provide an in-depth understanding of system-level design and its application to embedded systems. 2. To familiarize students with various system design methodologies and modeling techniques. 3. To develop proficiency in synthesizing hardware and software components for embedded systems. 				



4. To equip students with the ability to effectively verify and validate system designs.
5. To introduce cutting-edge tools and technologies in system-level design, as outlined in contemporary literature.

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	
	Total	45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:

Code	Course Learning Outcomes	Code of PLOs	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Identify challenges in the design of embedded systems using system level design techniques and tools	K1	Lectures, and reading assignments	Written exams, assignments, projects and oral presentations
1.2	Explain fundamentals of system level design and its concepts, terminologies and characteristics	K2		
2.0	Skills			
2.1	Design and implement modern embedded systems using system level design techniques and tools	S1	Lectures, project, discussions, tutorials	Written exams, assignments, projects and oral presentations
2.2	Apply principles of system level design to solve complex problems	S2		



Code	Course Learning Outcomes	Code of PLOs	Teaching Strategies	Assessment Methods
2.3	Communicate effectively through a written report embodying the design, implementation, evaluation of embedded systems using system level design techniques and tools	S3		
2.4	Evaluate the design of embedded systems using system level design techniques and tools	S4		
3.0	Values, autonomy, and responsibility			
3.1	Demonstrate commitment to ethical and professional responsibilities in designing embedded systems using system level design techniques and tools	V1	Lectures, project, discussions, assignments and projects	Group assignments and projects
3.2	Work in a team project to design and implement an embedded system using system level design techniques and tools	V2	Group assignments and projects	Group assignments and projects

C. Course Content:

No	List of Topics	Contact Hours
1.	Introduction to System Level Design for Embedded Systems	6
2.	System Design Methodologies	6
3.	Modeling of Embedded Systems	9
4.	System Synthesis	3
5.	Software Synthesis	3
6.	Hardware Synthesis	3
7.	Verification	9
8.	Stat-of -the-art System Level Design Tools in the literature	6
Total		45



D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Mid-Term Exam	9	20
2.	Assignments	4 and 9	20
3.	Project	11	20
4.	Presentation of scientific article	13	20
5.	Final Exam	15	20

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:

Essential References	“Embedded System Design: Modeling, Synthesis and Verification”, by Daniel D. Gajski, Samar Abdi, Andreas Gerstlauer, and Gunar Schirner, Springer, 2009, ISBN: 978-1-4419-0503-1 (hardcover), 978-1-4419-0504-8 (eBook)
Supportive References	Making Embedded Systems: Design Patterns for Great Software 2nd Edition by Elecia White, O'Reilly Media, 2024, ISBN-10 : 1098151542, ISBN-13 : 978-1098151546 Real-Time Systems: Design Principles for Distributed Embedded Applications, 3rd Edition, Hermann Kopetz and Wilfried Steiner, Springer, 2022, ISBN-10 : 3031119940, ISBN-13 : 978-3031119941
Electronic Materials	The instructor may provide as per requirements
Other Learning Materials	The instructor may provide as per requirements

2. Educational and Research Facilities and Equipment Required:

Items	Resources
Facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (Projector, smart board, software)	Projector
Other equipment (Depending on the nature of the specialty)	





F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Program Leaders	Indirect
Effectiveness of students' assessment	Program Leaders	Direct
Quality of learning resources	Students, Faculty	Indirect
The extent to which CLOs have been achieved	Students, Faculty, Program Leaders	Direct and Indirect
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	Computer and Network Engineering Department Council
REFERENCE NO.	The 18 th Session Of The Academic Year 1446
DATE	15/4/2025

