Course Specification
(Bachelor)

Course Title:	Reverse Software Engineering
Course Code:	SE4710
Program:	BSc in Software Engineering
Department:	Software Engineering
College:	College of Computing
Institution:	Umm Al Qura University
Version:	1.0
Last Revision Date:	22/04/2025

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A. General information about the course:

1. Course Identification

1. Credit hours: (3)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☐ Required		☒ Elective		
3. Level/year at which this course is offered: (3rd year/ 5th or 6th level) or (4th year/8th level)					
4. Course General Description:					
Software reverse engineering involves methods and techniques used to analyze, understand, and reconstruct software systems. This course provides students with the skills to decompile, disassemble, and document software, revealing design patterns, dependencies, and functionalities. It also addresses legal and ethical considerations, highlighting applications in software maintenance, cybersecurity, and legacy system analysis.					
5. Pre-requirements for this course (if any)**:**					
SE2301 - Software Modelling and Analysis					
6. Co-requisites for this course (if any)**:**					
N/A					
7. Course Main Objective(s):					
Upon completing this unit, students will be able to: 1. Develop a solid understanding of the fundamental principles, tools, and techniques involved in reverse engineering software systems. 2. Equip students with the skills to analyze and reconstruct software architectures and functionalities for purposes such as maintenance, security, and documentation. 3. Foster critical thinking and problem-solving abilities to tackle challenges in reverse engineering, including issues like obfuscation and dependency analysis. 4. Promote awareness of the ethical and legal considerations associated with software reverse engineering practices.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning	0	0

No	Mode of Instruction	Contact Hours	Percentage
3	Hybrid • Traditional classroom • E-learning	0	0
4	Distance learning	0	0

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	0
5.	**Others (specify)**	0
Total		45

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

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Understand the fundamental concepts and purpose of software reverse engineering.	K1	Lectures, Discussion	Quizzes, Exams
1.2	Identify tools, techniques, and frameworks commonly used in reverse engineering.	K2	Lectures, Discussion	Quizzes, Exams
2.0	**Skills**			
2.1	Analyze and document software architecture, components, and dependencies through reverse engineering.	S1	Case Studies, Exercises, Group Projects	Assignment, Project Report And Presentations

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.2	Perform static and dynamic analysis to identify software vulnerabilities and improve system security.	S2	Case Studies, Exercises, Group Projects	Assignment, Project Report And Presentations
2.3	Apply reverse engineering techniques to legacy systems for maintenance or migration.	S3	Case Studies, Exercises, Group Projects	Assignment, Project Report And Presentations
3.0	**Values, autonomy, and responsibility**			
3.1	Evaluate the ethical and legal implications of software reverse engineering.	V1	Ethical Dilemma Discussions, Case Studies	Written Reflections, Participation In Debates.
3.2	Collaborate in teams to conduct reverse engineering projects that align with professional and ethical standards.	V2	Group Projects	Project Report And Presentations

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction to Reverse Engineering** • Definition, applications, and ethical considerations.	**3**
2.	**Static and Dynamic Analysis** • Techniques for understanding software behavior and structure.	**6**
3.	**Disassemblers and Decompilers** • Tools and methods for reconstructing code.	**6**
4.	**Reverse Engineering Tools** • Overview of popular tools like IDA Pro, Ghidra, and Radare2.	**6**
5.	**Binary Code Analysis** • Understanding and analyzing machine code and executables.	**6**
6.	**Software Obfuscation and Deobfuscation** • Techniques to counter obfuscation in software.	**3**
7.	**Reverse Engineering for Security** • Identifying vulnerabilities, malware analysis, and penetration testing.	**3**
8.	**Reengineering Legacy Systems** • Strategies for understanding and updating older systems.	**6**
9.	**Reverse Engineering for Compatibility**	**3**

	• Ensuring interoperability with modern systems.	
10.	**Ethical and Legal Aspects of Reverse Engineering** • Compliance with intellectual property laws and ethical guidelines.	**3**
Total		**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	2-14	15
2.	Projects	2-14	15
3.	Assignments	2-14	10
4.	Mid Term	7	20
5.	Final Exam	16-17	40

*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	• T., É. (2025). *Reverse engineering with Ghidra: Exploring software internals*. • K., L. (2024). *Reverse engineering for hackers and developers: From novice to expert in disassembling and analyzing code*.
Supportive References	• Domas, S., & Domas, C. (2024). *x86 software reverse-engineering, cracking, and counter-measures*. Wiley. ISBN 978-1394199884. • Eilam, E. (2005). *Reversing: Secrets of reverse engineering*. Wiley Publishing. ISBN 978-0764574818.
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom

Items	Resources
Technology equipment (projector, smart board, software)	Projector
Other equipment (depending on the nature of the specialty)	N/A

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct, Indirect
Effectiveness of Students assessment	Faculty, Peer reviewer	Direct, Indirect
Quality of learning resources	Faculty, Course coordinator	Direct, Indirect
The extent to which CLOs have been achieved	Course coordinator, Program management committee	Direct
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**SOFTWARE ENGINEERING DEPARTMENT COUNCIL**
REFERENCE NO.	**THE 17TH MEETING FOR THE ACADEMIC YEAR 1446H**
DATE	**22/04/2025**