



Princess Sumaya جامعة
University الأميرة سميرة
for Technology للتكنولوجيا

Princess Sumaya University for Technology

King Hussein School for Computing Sciences

Cybersecurity Department

Course Syllabus – Summer Semester 2022/2023
15232 (Secure Assembly Coding)

1. Course Information

Catalog Description	This course aims to provide an overview of assembly language programming. Specific topics to be covered in this course include computer systems, data representation, numbering systems, instruction execution, symbolic coding, data word definition, laterals, location counter, indexing, indirect addressing, relative addressing, and assembly systems, reverse engineering using assembly coding. The students will be familiar with the assembly language and computer system components at the end of this course.
Credit Hours	1
Prerequisite	CS 11103 (Structured Programming)
Course Type	Lecture
Required/Elective	Required
Textbook	(Ref. 1) K. R. Irvine. <i>Assembly Language for x86 Processors</i> , 8 th edition, Prentice-Hall (Pearson Education), June 2019. ISBN: 978-0135381656. (Ref. 2) B. Dang, A. Gazet, E. Bachaalany. <i>Practical Reverse Engineering: x86, x64, ARM, Windows® Kernel, Reversing Tools, and Obfuscation</i> . John Wiley & Sons, June 2014. ISBN: 978-1-118-78731-1
References	1- N. Senthil Kumar, M. Saravanan, S. Jeevanathan, and S.K. Shah. <i>Microprocessors and Interfacing: 8086, 8051, and Advanced processors</i> , OXFORD University Press, 2012, ISBN 0-19-807906-0. 2- K. R. Irvine. <i>Assembly Language for Intel-Based Computers</i> . 6 th Edition, Prentice-Hall, 2015. 3- M. Rafiquzzaman. <i>Fundamentals of Digital Logic and Microcomputer Design</i> , 5 th Edition, John Wiley & Sons, 2005, ISBN-10: 0471727849.
Instructor/email	Dr. Qasem Abu Al-Haija/ q.abualhaija@psut.edu.jo
Class Schedule/ Location	Section 1: Sunday (9:00 - 10:00) / Room (IT102) Section 2: Tuesday (9:00 - 10:00) / Room (IT102)
Office Hours	Sun-Tue 10:00 – 11:00 + 12:0 – 1:00 or By Appointment.
Teaching Assistant	No

2. Course Contents

Week	Topic(s)	Chapter in Text
1	Overview of Computer System <i>Review previous concepts (signal, processing, logic design, integrated circuit, data representation, numbering systems storage measurement units, Microprocessors, machine language, ...etc.)</i>	Instructor Handouts
2-3	X86 Microprocessor systems: <i>8086 Overview, Features, & Signals 8086 Main Memory, Architecture of 8086, instruction execution, Concept of 8086 STACK, 8086 Pin Diagram and Functions</i>	Chapter 1+2(Ref. 1) + Instructor Handouts
4	Assembly Language for x86 <i>Assembly language concept, assembler, and disassembler, x86 Emulation: Virtual machine of Intel 8086 and Preliminaries.</i>	Instructor Handouts
5	Defining data and Symbolic Constants <i>Assembly language format, Directives vs. instructions, Using Assembly Directives</i>	Chapter 3 (Ref. 1)+ Instructor Handouts
6	Assembly Instruction Set <i>Basic Assembly Instructions, instruction formats, Addressing Modes</i>	Chapter 4 (Ref. 1)+ Instructor Handouts
7	Data Transfer Instructions <i>MOV, XCHG, IN, OUT, LEA, LDS, LES, LSS, Stack Operation: Push and pop instructions, Programming Examples/Practice.</i>	Chapter 4 (Ref. 1)+ Instructor Handouts
8-9	Arithmetic and Logical Instructions <i>Arithmetic (ADD, ADC, SUB, SBB, INC, DEC, NEG, CMP, MUL, IMUL, DIV, IDIV, ...), Logical (AND, OR XOR, NOT, TEST, SHL, SHR, SAL, SAR, ROL, ...), Programming Examples/Practice.</i>	Chapter 4 (Ref. 1)+ Instructor Handouts
10	Branch Instructions <i>Unconditional branch Instructions (Call, RET, JMP), Conditional branch Instructions (Using CMP instructions such as equal, above, below, less than, or greater than/Using such as zero, positive, carry, parity, overflow), Programming Examples/Practice.</i>	Chapter 6 (Ref. 1)+ Instructor Handouts
Midterm Exam		
11	Flags, Processor, and Iteration Instructions <i>Flags Control Instructions (such as PUSHF, POPF, CLC...), Iteration Control Instructions (such as LOOP, LOOPE, JCXZ...), Processor Control Instructions (such as NOP, HLT, LOCK)</i>	Chapter 3 (Ref. 1)+ Instructor Handouts
12	String/Array Instructions <i>Such as MOVSB, MOVSW, CMPSB, CMPSW, ..., Programming Examples, and Practice.</i>	Chapter 9 (Ref. 1)+ Instructor Handouts
13-15	Reverse Engineering <i>Understand Reverse Engineering, Software Techniques of Reverse Engineering, Reverse Engineering for Assembly, Reverse Engineering Tools, Obfuscation, and its techniques.</i>	Chapter 5 (Ref. 2)+ Instructor Handouts
Final Exam		

3. Course Learning Outcomes

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

1. Describe the main concepts and components of the computer system.
2. Describe the internal and external architecture of the microprocessor system.
3. Ability to write, debug, assemble, and execute assembly programs to develop real applications.
4. Familiarity with reverse engineering methods and obfuscation methods for assembly language.

5. Assessment Policy

Assessment Tool	Expected Due Date	Weight
Midterm Exam	To be decided by the instructor	30%
Class Activities	To be decided by the instructor	30%
Final Exam	To be decided by the instructor	40%

6. Contribution of the Course to the Professional Component

Computer Science Topics	100%
General Education	20%
Mathematics & Basic Sciences	20%

7. Expected level of proficiency from students entering the course

Mathematics	Some
Physics	Not applicable
Technical writing	Some
Computer programming	Some

8. Material available to students, instructors, TAs, and department at end of the course

	Students	Department	Instructors	TA(s)
Course objectives and outcomes form	X	X	X	
Lecture notes, homework assignments, and solutions	X	X	X	
Samples of homework solutions from 3 students		X		
Samples of exam solutions from 3 students		X		