الجامعة الافتراضية السورية
SYRIAN VIRTUAL UNIVERSITY

Course Definition

Compiler Project

Information

Technology

Engineering

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Syrian Arab Republic		الجمهورية العربية السورية
Ministry of Higher Education and Scientific Research		وزارة التعليم العالـــي والبحث العلمي
Syrian Virtual University		الجامعة الافتراضية السورية

1. Basic Information:

Course Name	Compiler Project
Course Code	SCP601
Number of Presentational Sessions*	20
Number of Synchronous Sessions**	10
Number of Shorter Tests***	2
Number of Exams***	1
Theoretical Sessions Work Load (hrs.)	60
Practical Sessions Work Load (hrs.)	30
Credit Hours	6

***Each presentational session comprises both recorded lecture (1.5 hrs.) and interactive learning content (1.5 hrs.).**

****Each synchronous session comprises the interactive lecture carried out in real time in a virtual class (1.5 hrs.).**

*****Each shorter test is 0.5 hr. long. The final exam is 2 hrs. long.**

N.B.

Generally, each chapter requires two presentational sessions: one for the recorded content and one for the interactive content (unless the chapter is too long, in which case it may require more sessions (. This note applies to synchronous sessions as well, where each chapter requires one synchronous session generally.

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2. Prerequisites courses:

Course	Code
Compilers	BCM601
Software Engineering II	SSE602

3. Course Objectives:

The aim of this course " Compiler Project ", to present the concepts needed to design and implement compiler code generation and optimization techniques.
In a class project, students will construct an optimizing compiler for a simple and high level language.
After completing this course, the student should demonstrate an ability to design and implement a compiler for a small language.

4. Learning Outcomes (LO):

By the end of this course, the learner is expected to acquire and learn the following subjects:

- Build Lexical Analysis
- Build Syntactical Analysis
- Build symbol table and semantic tree
- Build Semantic Analysis
- Code Generation
- Optional: Code Optimization
- Evaluation the build compiler on machine code

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5. Assessment Results:

Chapter Number	Chapter Title	General Objectives	Assessment Type				
			Interactive Content & Recorded Sessions	Applied Activities (Synch. Sessions)	Final Exam*/ Shorter Tests**	Presentations and Interviews***	Reports****
CH1	**Step1: Lexical Analysis & Syntactical Analysis**	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√
CH2	**Step2: symbol table and semantic tree**	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√
CH3	**Step3: Semantic Analysis**	Comprehension –Analytical Thinking –	√	√	√	√	√

		Tools and Application Hands– On					
CH4	**Step4: Code Generation**	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√
CH5	**Step5: MiniJava Code Generation**	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√
CH6	**Step6 Optimisation**	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√
CH7	**Annex1**	Comprehension	√	√	√	√	√

	Virtual Machine	–Analytical Thinking – Tools and Application Hands– On					
CH8	**Annex2 File .L File .y**	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√
CH9	**Working and delivering phases**	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√

***The final exam is two hours long and is given at the end of the course.**

****Shorter tests are about 30 minutes long and are given after three or four lectures throughout the semester during synchronous sessions.**

*****Presentations, interviews, and reports are submitted once after each three or four lectures throughout the semester during synchronous sessions.**

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6. Course Syllabus:

Chapter	Subject	Content	Number of Learning Objects	Number of synchronous Learning Objects
CH1	**Lexical Analysis & Syntactical Analysis**	1. Introduction 2. Lexical Analysis 3. Syntax Analysis 4. Errors Treatment	4	2
CH2	**symbol table and semantic tree**	1. Introduction 2. Symbol Table 3. Semantic Tree	3	1
CH3	**Semantic Analysis**	1. Introduction 2. Relationships between Classes and Types 3. Class Attributes ,Constructors and Methods 4. Expressions 5. Instructions and Context Definition 6. Typeclasses 7. Errors Treatment	7	3
CH4	**Code Generation**	1. Memory Organization and Calculations	2	1

		2. Instructions Code Generation		
CH5	**MiniJava Code Generation**	1. Data of Generated Code according to Virtual Machine Architecture 2. Compilation 3. Organization of Code Generation	**3**	**1**
CH6	**Optimisation**	1. Introduction 2. Direct Execution of Operations on Constant Values after compilation 3. Irrelevant Operations Deletion 4. Copying Instruction Editing 5. Common Expressions Calculation	**5**	**2**
CH7	**Virtual Machine**	1. Machine Organization 2. Instructions 3. Code Implementation 4. Lexical Rules and Syntax Rules of Virtual Machine Language 5. Machine Usage	**5**	**2**
CH8	**File .L** **File .y**	1. MiniJava.L Final File Extension as Flex Input 2. MiniJava.Y File Extension as Bison Input	**2**	**1**

CH9	**Working and delivering phases**	1. Working phases 2. Delivering phases	**2**	**1**

7. Practical Activity:

- **Tools and Labs:**

Tool Name	Description
Flex	Tool to Build Lexical Analysis
Bison	Tool to Build Syntactical Analysis
Dot Net / Other	Programming Tool for object oriented

- **Practical Activities per Chapters:**

Chapter	Activities Type	Remarks
CH1	☐ Exercises ☐ Homework ☐ Webinars ☑ Project ☑ Experiment ☐ Other	
CH2	☐ Exercises ☐ Homework ☐ Webinars ☑ Project ☑ Experiment	

	☐ Other	
CH3	☐ Exercises ☐ Homework ☐ Webinars ☑ Project ☑ Experiment ☐ Other	
CH4	☐ Exercises ☐ Homework ☐ Webinars ☑ Project ☑ Experiment ☐ Other	
CH5	☐ Exercises ☐ Homework ☐ Webinars ☑ Project ☑ Experiment ☐ Other	
CH6	☐ Exercises ☐ Homework ☐ Webinars ☑ Project ☑ Experiment ☐ Other	
CH7	☐ Exercises	

	☐ Homework ☐ Webinars ☑ Project ☑ Experiment ☐ Other	
CH8	☐ Exercises ☐ Homework ☐ Webinars ☑ Project ☑ Experiment ☐ Other	
CH9	☐ Exercises ☐ Homework ☐ Webinars ☑ Project ☑ Experiment ☐ Other	

8. References:

1. Andrew W. Appel, Modern Compiler Implementation in Java. Cambridge University Press, 1998 or 2002
2. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Monica S. Lam, Compilers: Principles, Techniques, and Tools. Addison-Wesley, 2006 (optional).
3. Thomas W. Parsons, Introduction to Compiler Construction. Computer Science Press, 1992