



الجامعة الافتراضية السورية  
SYRIAN VIRTUAL UNIVERSITY

# Compilers

## Course Definition

**I**nformation

**T**echnology

**E**ngineering



Powered by:



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## 1. Basic Information:

<b>Course Name</b>	Compiler
<b>Course Code</b>	BCM601
<b>Number of Presentational Sessions*</b>	2x12
<b>Number of Synchronous Sessions**</b>	12
<b>Number of Shorter Tests</b>	2
<b>Number of Exams***</b>	1
<b>Theoretical Sessions Work Load (hrs.)</b>	72
<b>Practical Sessions Work Load (hrs.)</b>	36
<b>Credit Hours</b>	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.).

\*\*\* 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
Automata & Formal Languages	BAU501

## 3. Course Objectives:

The "**Compiler**" course is one of the basic courses of IT engineering. It introduces the basic principals and theoretical background and different techniques of compilers design and realization.

The course focuses on analysis methods implemented by compilers to get source code programs main components, as well as, on basic methods of developing programs equivalent semantically to their source codes.

The different steps in the compiler structure are discussed based on Automation and Formal Languages.

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#### 4. Learning Outcomes (LO):

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

- Understand Compiler structure
- Understand Lexical Analysis
- Understand Syntactical Analysis
- Understand symbol table and semantic tree
- Understand Semantic Analysis
- Understand Code Generation
- Understand Code Optimization
- Competence in Lexical tool
- Competence in Syntactical tool

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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	Introduction	Comprehension –Analytical Thinking –Tools and Application Hands– On	✓	✓	✓	✓	✓
CH2	Compiler Structure	Comprehension –Analytical Thinking –Tools and Application Hands– On	✓	✓	✓	✓	✓
CH3	Lexical Analysis	Comprehension –Analytical Thinking –Tools and Application Hands– On	✓	✓	✓	✓	✓
CH4	Lexical Analysis Tool – Lex	Comprehension –Analytical Thinking –Tools and Application Hands– On	✓	✓	✓	✓	✓

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CH5	Syntactical Analysis	Comprehension -Analytical Thinking -Tools and Application Hands- On	✓	✓	✓	✓	✓
CH6	Syntactical Analysis Tool - Bison	Comprehension -Analytical Thinking -Tools and Application Hands- On	✓	✓	✓	✓	✓
CH7	Semantic Analysis	Comprehension -Analytical Thinking -Tools and Application Hands- On	✓	✓	✓	✓	✓
CH8	Code Generation and Optimisation	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	Introduction	<ol style="list-style-type: none"> <li>1. Compiler concept.</li> <li>2. Compilers types.</li> <li>3. Different compilers.</li> </ol>	3	1
CH2	Compiler Structure	<ol style="list-style-type: none"> <li>1. Description of compiler steps.</li> <li>2. Analysis step.</li> <li>3. Synthesis and generation steps.</li> <li>4. Parallel steps.</li> <li>5. Terminology differences.</li> </ol>	5	2
CH3	Lexical Analysis	<ol style="list-style-type: none"> <li>1. Analyze the program to tokens.</li> <li>2. Token's types.</li> <li>3. Rules for every token's types.</li> </ol>	3	1
CH4	Lexical Analysis Tool – Lex	<ol style="list-style-type: none"> <li>1. Explain Flex</li> <li>2. Execute to test</li> <li>3. Assignment</li> <li>4. Correct the assignment</li> </ol>	5	2
CH5	Syntactical Analysis	<ol style="list-style-type: none"> <li>1. Understand Lexical analysis</li> <li>2. Types of lexical analysis: LL1, LSR, LR1, LALR</li> </ol>	6	3

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<b>CH6</b>	Syntactical AnalysisTool – Bison	<ol style="list-style-type: none"> <li>1. Explain Bison</li> <li>2. Execute to test</li> <li>3. Assignment</li> <li>4. Correct the assignment</li> </ol>	<b>6</b>	
<b>CH7</b>	Semantic Analysis	<ol style="list-style-type: none"> <li>1. Semantic Tree</li> <li>2. Symbol table</li> <li>3. Type checking</li> </ol>	<b>2</b>	
<b>CH8</b>	Code Generation and Optimisation	<ol style="list-style-type: none"> <li>1. Code generation</li> <li>2. Optimization</li> <li>3. Assignment to execute</li> <li>4. Follow up</li> </ol>	<b>4</b>	



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## 7. Practical Activity:

- **Tools and Labs:**

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

- **Practical Activities per Chapters:**

Chapter	Activities Type	Remarks
CH1	<input checked="" type="checkbox"/> Exercises <input checked="" type="checkbox"/> Homework <input type="checkbox"/> Webinars <input type="checkbox"/> Project <input checked="" type="checkbox"/> Experiment <input type="checkbox"/> Other	
CH2	<input checked="" type="checkbox"/> Exercises <input checked="" type="checkbox"/> Homework <input type="checkbox"/> Webinars <input type="checkbox"/> Project <input checked="" type="checkbox"/> Experiment <input type="checkbox"/> Other	

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<b>CH3</b>	<input checked="" type="checkbox"/> Exercises <input checked="" type="checkbox"/> Homework <input checked="" type="checkbox"/> Webinars <input type="checkbox"/> Project <input checked="" type="checkbox"/> Experiment <input type="checkbox"/> Other	
<b>CH4</b>	<input checked="" type="checkbox"/> Exercises <input checked="" type="checkbox"/> Homework <input type="checkbox"/> Webinars <input type="checkbox"/> Project <input checked="" type="checkbox"/> Experiment <input type="checkbox"/> Other	
<b>CH5</b>	<input checked="" type="checkbox"/> Exercises <input checked="" type="checkbox"/> Homework <input type="checkbox"/> Webinars <input type="checkbox"/> Project <input checked="" type="checkbox"/> Experiment <input type="checkbox"/> Other	
<b>CH6</b>	<input checked="" type="checkbox"/> Exercises <input checked="" type="checkbox"/> Homework <input type="checkbox"/> Webinars <input type="checkbox"/> Project <input checked="" type="checkbox"/> Experiment <input type="checkbox"/> Other	

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<b>CH7</b>	<input checked="" type="checkbox"/> Exercises <input checked="" type="checkbox"/> Homework <input type="checkbox"/> Webinars <input type="checkbox"/> Project <input checked="" type="checkbox"/> Experiment <input type="checkbox"/> Other	
<b>CH8</b>	<input checked="" type="checkbox"/> Exercises <input checked="" type="checkbox"/> Homework <input type="checkbox"/> Webinars <input checked="" type="checkbox"/> Project <input checked="" type="checkbox"/> Experiment <input type="checkbox"/> Other	

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## 8. References:

1. Introduction to Compilers and Language Design, Second Edition, Prof. Douglas Thain, 2020.
2. Basics of Compiler Design, Anniversary edition, Torben Ægidius Mogensen, 2010. ISBN 978-87-993154-0-6.
3. Theory Principles of Compiler Design – Alfred V. Aho, Jeffrey D. Ullman – 1980.