

## INDUSTRIAL ENGINEERING DEPARTMENT

### IE 201 Intermediate Programming Spring 2016

**Type:** Required  
**Credits/ECTS:** 4 Credits / 7 ECTS  
**Class/Laboratory/PS schedule:** Monday 11:00-13:00 (M3100) – Regular Class  
Tuesday 15:00-17:00 (M1100) – Regular Class

**Instructor:** Z. Caner Taşkın ([caner.taskin@boun.edu.tr](mailto:caner.taskin@boun.edu.tr))  
Engineering Building, Room: M4017  
Office Hours: T 09:00 – 11:00, T 13:00-15:00

**Prerequisite(s):** CMPE 150 (Introduction to Programming) or equivalent.

#### Course Description:

The main purpose of this course is to present intermediate programming techniques including basic data structures (arrays, lists, etc.) and fundamental algorithms (sorting, searching, etc.). A major emphasis will be given to object-oriented (O-O) programming in C++ language, in relation to O-O Design and O-O Analysis.

#### Textbook(s) / other required material:

A compilation of lecture notes will be available for the participants at the beginning of the semester. Additionally, the following books are reserved at the library for this course. Although none of them covers all the course topics, you may find them useful at certain sections of the course as supporting textbooks.

- Mark Allen Weiss. 2003. 2nd Edition. Data Structures & algorithm Analysis in C++. Addison Wesley.
- Stroustrup Bjarne. 1993. 2nd Edition. The C++ Programming Language. Addison Wesley.

#### Course objectives (and program outcomes):

By the completion of the course, the students will be able to;

- Implement algorithms in C++
- Use debugging tools such as breakpoints, watch windows, call stack
- Understand commonly used data structures such arrays, linked lists, trees
- Analyze worst-case complexity of algorithms
- Analyze and design complex systems using O-O Analysis and Design concepts
- Understand and draw class, sequence, collaboration and use case diagrams in UML

Considering these objectives, this course mainly addresses the following student outcomes of the industrial engineering undergraduate program;

- *Student Outcome (c)*: An ability to design diverse systems including manufacturing, service, logistics, financial and information, to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- *Student Outcome (e)*: An ability to identify, model, formulate and solve industrial engineering problems
- *Student Outcome (k)*: An ability to use the techniques, skills, and modern engineering tools necessary for industrial engineering practice.

**Outline:**

<b>Week</b>	<b>Topic</b>	<b>Subject</b>
1	Introduction	<i>Basics</i>
		<i>Flow control</i>
		<i>Functions</i>
		<i>C++ program structure</i>
2	Structures	<i>Struct</i>
		<i>Class</i>
		<i>Data hiding</i>
2	Constructors and Destructors	
3	Object oriented analysis design 1	<i>Concepts</i>
		<i>UML 1</i>
4	Pointers 1	<i>Memory allocation</i>
5	Pointers 2	<i>Arrays</i>
		<i>Multidimensional arrays</i>
		<i>Strings</i>
5	References	<i>C++ reference</i>
		<i>Call by reference / value</i>
6	Polymorphism	<i>Inheritance</i>
		<i>Function override</i>
7		<i>Abstract classes</i>
7	Object oriented analysis design 2	<i>UML 2</i>
8	Operator overloading	
8	Templates	
8*	STL	
8	Streams	<i>Basics</i>
		<i>File operations</i>
9	Algorithms 1	<i>Algorithm analysis</i>
		<i>Recursion</i>
9	Data structures	<i>Arrays</i>
		<i>Lists</i>
		<i>Trees</i>
10		<i>B-Trees</i>
		<i>Hash Table</i>
11*	Algorithms 2	<i>Sorting</i>

**Grading:**

- |                   |     |
|-------------------|-----|
| • Homework / Quiz | 15% |
| • Midterm         | 20% |
| • Project         | 40% |
| • Final           | 25% |

**Project:**

Preparing a term project will constitute a major portion of the expected course work. Teams of 2-3 students will be responsible of

- writing a proposal to develop a software in C++,
- writing an analysis report,
- writing a design report,
- and finally, developing the software and the appropriate user documentation.

Each team is required to work independently and create an original software product. Students that do not satisfy this requirement or get excessive help during the project will receive zero as the project grade, and will not be allowed in the final exam.

*Prepared by, and date of preparation: Z. Caner Taşkın, January 2016*