

1. Course Code

2291

2. Course Title

Data Structures and Object Oriented Programming (Java)

3. Teacher

WANNOUNS, Muhammad

4. Term

Fall 2

5. Course Overview and Objectives

This course introduces the students to the Object Oriented (OO) paradigm in general and to the data structures used in it. It is NOT intended as an introduction to programming. The course utilizes the popular programming language Java to introduce the concepts of programming in OO and the implementations of different data structures in it such as the arrays, lists, queues and trees. The course serves as a base for any developer who intends to use Java in developing web, mobile, and desktop applications.

6. Course Goals (Attainment Targets)

- (1) Recognize the features of Object Oriented programming
- (2) Describe the features of data structures implemented in OO language
- (3) Experiment with the development tools and the use of OO language and data structures
- (4) Compare the different data structures in terms of memory usage and complexity
- (5) Use Java language and the data structures in developing a simple application.
- (6)

7. Correspondence relationship between Educational goals and Course goals

Educational goals of the school			Course Goals
High level ICT skills	Basic academic skills		(1) (2)
	Specialized knowledge and literacy		(3) (4) (5)
Human skill (Tankyu skill)	Ability to continually improve own strengths		
	Ability to discover and resolve the problem in society	Problem setting	
		Hypothesis planning	
		Hypothesis testing	
		Practice	
	Fundamental Competencies for Working Persons	Ability to step forward	
		Ability to think through	
		Ability to work in a team	
Professional ethics			

8. Course Requirements (Courses / Knowledge prerequisite for this course)

The following courses are required to be completed.

[1] Fundamentals of Computer Programming (2209)

9. Textbooks (Required Books for this course)

For this course, a set of lecture slides/pages, handouts, and other resources will be distributed in a timely manner through Moodle.

10. Reference Books (optional books for further study)

[1] Core Java Volume I--Fundamentals, ISBN-13: 978-0134177304

[2] Data Structures and Algorithms in Java, ISBN-13: 978-0672324536

11. Evaluation

Goals	Evaluation method & point allocation					
	examination	Quiz	Reports	Presentation	Deliverables	Other
(1)		○				
(2)		○				
(3)					○	
(4)					○	
(5)					○	
(6)						
Allocation		40			60	

12. Notes

This course contains both theoretical and practical parts. Be prepared for using the shell interface and for coding (in Java).

Quizzes and projects have deadlines and they won't be postponed unless a serious issue occurs.

13. Course plan

(Notice) This plan is tentative and might be changed at the time of delivery

Lesson 1: (Course orientation, Definition and characteristics of Object Oriented paradigm)	(Discussion, Lecture 45 minutes, Practice 45 minutes)
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[1] Course syllabus

Lesson 2: (First Java application, variables and types in Java)	(Practice, 90 minutes)
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- [1] Our first Java application
 - + Writing the code of the application
 - + Compiling the application from the command-line
 - + Running the application
- [2] Variables and types in Java
 - + Types of variables in Java
 - + Declaring, assigning values to, and reading values of variables
 - + Arrays
 - + Variable scope

Lesson 3: (Methods, parameters, arguments, operators, and expressions) (Practice, 90 minutes)

- [1] Methods
 - + Invoking methods
 - + Passing parameters
- [2] Command-line arguments
- [3] Operators and expressions.

Lesson 4: (Flow control statements, complex types (Classes)) (Lecture 30 minutes, Practice 60 minutes)

- [1] Conditional statements
 - + if-else if-else
 - + switch
- [2] Loops
 - + for
 - + while
- [3] break and continue
- [4] Complex types (Classes)
 - + Access modifiers
 - + Packages.

Lesson 5: (Objects-1-) (Lecture 30 minutes, Practice 60 minutes)

- [1] Instantiating objects from classes.
- [2] Using objects.
 - + Accessing fields
 - + Invoking methods
- [3] Static variables and methods.

Lesson 6: (Objects-2-) (Lecture 30 minutes, Practice 60 minutes)

- [1] Constructors
- [2] Method overloading
- [3] Inheritance
 - + Private fields in the parent class
 - + Method overriding (Polymorphism)

Lesson 7: (Exceptions)

(Lecture 30 minutes,
Practice 60 minutes)

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- [1] Exceptions
 - + Checked exception
 - + Runtime exception

Lesson 8: (I/O)

(Lecture 30 minutes,
Practice 60 minutes)

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- [1] Standard I/O
 - + Standard-in
 - + Standard-out
 - + Standard-err
 - [2] File I/O

Lesson 9 : (Application Project-1-)

(Practice, 90 minutes)

In this session, we are going to write a simple application to manage the courses.

- 1- Command-line interface
- 2- User actions: add a new course, list courses, search courses, modify a course, delete a course, save courses to a file, and load courses from a file.
- 3- Accepts a file name that includes a list of courses.
- 4- The course attributes are: ID (text 'dd-d-d'), name (text without special characters), term (F1~3-S1~3), day (Mon~Fri), time slot (1-6), and instructor's name (text without special characters).
- 5- Two courses can't have the same ID.
- 6- Uses arrays to save the courses

Lesson 10 : (Application Project-1- continued)

(Practice, 90 minutes)

Continue developing the course management application.

Lesson 11 : (Data structures -1-)

(Lecture 30 minutes,
Practice 60 minutes)

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- [1] One-dimension arrays
 - [2] Lists
 - + Array list
 - + Linked list
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Lesson 12 : (Data structures -2-)

(Lecture 30 minutes,
Practice 60 minutes)

- [1] Stack
 - [2] Queue
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Lesson 13 : (Data structures -3-)

(Lecture 90 minutes)

- [1] Trees
 - + Binary tree
 - + Binary search tree
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Lesson 14 : (Application Project-2-)

(Practice, 90 minutes)

In this session we write an application that uses the binary search tree structure to search for a specific course in the set of courses we have.

- 1- Binary search tree class
 - 2- Read the course information from a file
 - 3- Search records
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Lesson 15: (Wrap up)

(Discussion 90
minutes)

- [1] Discuss and review the topics covered in this course.
 - [2] Suggestions of improvements.
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