Java Programming I:
Learning to Build Object-Oriented Programs with Java

April 16, 2007

OTED 750

Old Dominion University
# Table of Contents

Course Description.................................................................................. 3
Course Justification................................................................................ 4
Target Audience...................................................................................... 4
Description of Simulation.................................................................... 5
Type of Simulation................................................................................ 7
Scope of Simulation............................................................................... 8
Learning Objectives............................................................................. 8
Problem Scenario.................................................................................. 9
Participant Roles.................................................................................. 10
Staff and Peripheral Roles................................................................. 10
Events.................................................................................................. 11
Model of Simulation............................................................................ 13
Consequences....................................................................................... 13
Resource Requirements....................................................................... 14

Appendices
- Appendix A (Course Overview).........................................................16
- Appendix B (Requirements Document)...........................................17
- Appendix C (Simulation Phase Requirements).................................18
- Appendix D (Model of Simulation)..................................................19
- Appendix E (Rubric for Simulation Assessment).............................20
Proposed Course Title:

Java Programming I: Learning to Build Object-Oriented Programs with Java

Course Description:

This course is offered at the higher education level to provide a basic introduction to creating object-oriented programs utilizing the java language. The course provides a collection of information ranging from the creation of flowcharts in the design phase to creating console applications and applets using java. The course focuses on students who have little or no prior experience in object oriented programming. Some of the major concepts and techniques covered in this course are as follows: constructing programming codes based on requirements documents, developing algorithms for programs, coding and debugging programs, and creating various formats of programs using the java language.

The course incorporates lectures and PowerPoint presentations, as well as laboratory hours to work on various exercises to practice the skills. This allows the students to visualize, as well as implement the programming technique associated with java. Evaluations are administered after each unit to verify the programming skill sets have been mastered. During the course, students will cover five chapters of the text incorporating these concepts and techniques during the first twelve weeks of the course, and as a final assessment they will participate in a simulation project, which will cover the last three weeks of the course. The assessment will be presented in class on the exam date to demonstrate how well the students have learned the overall procedures of the object oriented programming phases (see appendix A for course overview).
**Course Justification:**

There is an immense need for programmers in today’s technological society. Currently, java is a predominantly used language in the programming field. This course is offered as part of the information technology curriculum within the community college program. In many of the technology programs, students are required to complete at least six credit hours in the programming area in order to graduate with an associate degree in information technology. Therefore, the java course is highly recommended for those completing information technology degrees to partake in and learn the concepts of this language. By offering this course, students will encompass some of the cutting edge skills needed to be successful in programming career paths. The course is also of good quality for those who are currently operating in the programming field and would like to learn more existing languages and sharpen their current skills.

**Target Audience:**

This course is designed for those who are participating in community college level courses. The target audience for the java course may come from three various arenas. The primary participants are students who are partaking in the information technology curriculum working toward the completion of their associate degrees, but it is not limited to students only in that track. Other community college students may elect to sign up for the course as long as they have met the requirements of the basic skills needed to function in a java course. In order to be a programming candidate, these students must have completed a basic computer literacy course, so they have a basic knowledge of computers, as well as a basic mathematics course. Other
participants who are currently practicing in the information technology field may wish to sign up and take the course to learn the language for their careers as a non-degree seeking student.

**Description of the Simulation:**

The simulation will take place in a classroom at the community college where the semester course has been conducted. Students will be paired into teams of two while they participate in the simulation. They will be acting as programming consultants running their own businesses that create programs for various companies who request to preview their services. Even though the simulation is being conducted in a classroom setting, participants are required to act and attend the meetings in a professional manner as if they are in the business world. They are required to wear professional apparel, as well as bring all of their materials in a professional portfolio each day of the simulation.

The simulation will consist of four phases. It will take place over the final three weeks of the java course. These three weeks consist of a total of six class meetings which are ninety minutes long. Participants may need to meet outside of the scheduled meetings to work on various phases of the simulation. The initial phase of the simulation will begin the first day of this three week period in which the participants will be presented with the scenario by the instructor who is acting as the vice president of the company. The company in the simulation will be called Friendly Fitness Equipment. During this phase, they will also be provided with the requirements document by the vice president, which will be a professional document outlining the aspects of what is needed in the applications the programming teams create. The programming teams will be expected to review this document and request any other information they believe is needed prior to beginning the design phase from the vice president of the company. If they feel they have all the information they need at this point, they may move to the
next phase in the simulation. Participants are allowed to come back to the vice president at any point in the simulation to request additional information they need.

Upon entering phase two of the simulation, the teams will create a flowchart depicting the flow of the console application they are planning to create for the company. Once they have completed the flowchart and generated a computer file, they will present to the vice president of the company and begin programming the console application. They must code, compile, debug if needed, run, and test the console application to complete phase two. After the program functions correctly and provides the correct output, the participant teams can move to phase three of the simulation.

Upon entering phase three of the simulation, the participants will create a storyboard displaying how the applet application will be laid out. The programming teams may request other information from the vice president in relation to the logos and colors for the applet. Once they have created a digital drawing of the storyboard, they will present it to the vice president of the company to be sure it is acceptable. If the storyboard is acceptable, they will begin coding the program for the applet application. Once they have created the code for the application, they will compile, run, and test it to check the functionality. Once the program provides accurate output, the participants are ready to move to phase four of the simulation.

In phase four of the simulation, the teams will be required to prepare all of their documents for the final presentation of their products to the vice president of the company. They will be expected to manage their files which they created during the simulation and organize them in a professional manner. The programming teams will also have to create a professional portfolio of hard copies of all of the documents they created throughout each phase of the simulation. Once they have done so, the participant teams will have to put together a
professional presentation to demonstrate what they have created over the three weeks of the simulation. They will present the information as a team to the vice president of the company in order to sell their application and license agreement for the company’s use. During this portion of the simulation, the instructor (vice president) will assess their java applications, and they will receive a final assessment grade based on a rubric which was created for the simulation. This will close the four phases of the simulation process.

Utilizing this simulation as part of the java course is extremely significant to ensuring that the students have mastered the concepts and techniques which they were presented with during the course. The simulation covers many of the topics and skills which were covered throughout the first twelve weeks of the course. This allows the students and the instructor to sharpen weak points if they exist, as well as prepare them for the reality of the programming field and how it functions.

**Type of Simulation:**

This simulation which is utilized in the java course is considered to be diagnostic in nature. The simulation participants are given a document by the controller describing the provisions which need to exist within the java programs they are expected to construct. After reviewing the document, the participants must complete sequential steps for the creation of the programs. Throughout the phases of the simulation they must interpret what data is needed and how to produce the correct output for each application which they are required to generate. They must evaluate the programs which they create to ensure they function properly, as well as do what is requested by the controller. The participants must also manage all data professionally during the simulation so they may produce a portfolio which incorporates all of the files they
have created throughout the simulation process. Participants must also request other needed information and get approval from the controller, which is the vice president of the company contracting them to craft the programs.

**Scope of Simulation:**

The final assessment simulation will cover many of the major concepts and techniques which were presented throughout the first twelve weeks of the course related to the java programming language. The simulation will be used as a final assessment in the course to ensure the java programming students have mastered the skills which they have had to learn during the course.

The participants will be demonstrating these concepts and techniques in a hands-on environment. They will be demonstrating the ability to step through each phase of the programming cycle and produce professional documents based on the need for a new computer application. The participants will be constructing graphical flowcharts to display the flow of the console program, as well as graphical storyboard to provide a visualization of how the applet will be laid out. They will also demonstrate the ability to build basic programs which prompt for input and provide output to the users. The participants will also be required to demonstrate their problem solving skills over the process of building a java program by debugging any compilation errors or design issues which are likely to exist during the simulation process.
**Learning Objectives:**

The learning objectives for the simulation are directly related to the concepts and techniques which the participants have been learning throughout the first twelve weeks of the semester. The participants will be provided these objectives at the beginning of the simulation. The following are learning objectives which will be covered in the final assessment simulation:

- ✓ Generate a graphical flowchart illustrating the step-by-step flow of the program using Microsoft Word.
- ✓ Construct a console application using the textpad software which compiles and runs successfully based on the provided requirements document.
- ✓ Create a storyboard illustrating the graphical appearance of how the applet program will look using Microsoft Word.
- ✓ Construct a web-based applet using the textpad software which compiles and runs successfully based on the provided requirements document.
- ✓ Diagnose any coding problems within the program which arise during compilation so the program will compile and run correctly.
- ✓ Prepare a professional portfolio for the programming process for proper documentation incorporating hardcopies of all files created in the programming phases.

**Problem/Scenario:**

In the simulation, the participants will be paired into teams of two in which they will be acting as IT programming consultants who are operating a company which contracts with businesses to build computer applications that they need. The vice president of an outside company will present the programmers with a professional requirements document requesting
new programs to calculate sales commissions which are needed for the Friendly Fitness Equipment Company. The programming teams will review the document and request any additional information they feel they need at that time from the vice president. They will then go through the programming cycle to generate a console application and a web driven applet, as well as other supporting documents to provide a model of each programs function. All of the files which the participant teams create will be based on the requirements document given to them by the vice president of the company in need of the new applications (see appendix B for the requirements document).

Participant Roles:

The simulation participants are the students which are enrolled in a java programming course at the community college. The participants are paired into groups of two to create a team who are acting as java programmers owning their own consultant company which are contracted to create programs for other companies in need of their expertise. The teams have been consulted by a vice president of a company called Family Fitness Equipment to create a program for the businesses need for a new application.

Staff and Peripheral Roles:

The staff and peripheral roles are limited because that the simulation takes place in a java programming course offered by a community college. The staff role would be based on who the instructor of the course is. The instructor of the course will be acting as the vice president of the company requesting the creation of the applications which are needed to complete the simulation. The vice president will give them the go ahead to advance to other steps of the
programming phases as needed. At the close of the simulation, the instructor still acting as the vice president, will observe the participants presenting their final products in a professional manner. The instructor will then provide the participants with a final assessment grade on the program which was created during the simulation.

**Events:**

The initiating event of the phases of the simulation will be when the participants are provided with the requirements document by the vice president of the company asking for their assistance for the creation of new applications to calculate the employees at Friendly Fitness Equipments’ sales commission bases on the type of sale they make, such as in store sales, phones sales, or outside sales. The participants will review the document as a team to verify they have all information which is needed to begin the design phase of the programming cycle. There will be a portion of information which is not incorporated initially in the requirements document. Participants may return to the vice president after reviewing the document for the material, or they may not recognize it initially and move on. The participants may return at a later point in the simulation when they recognize the absence of some needed information, such as the commission rates for the employees, algorithms for the programs (which they may put together themselves), and what the document means by valid input for the programs. Once they are satisfied with the requirements document, they are ready to move to phase two of the simulation.

As they enter phase two, the participants will begin the process of designing the console application. First, the participants must use Microsoft Word and generate a graphical flowchart displaying the flow of this application. Once the flowchart is created, they will return to the vice president of the company to be sure their ideas are one in the same. If it is not satisfactory, they
will have to revamp the flowchart until it meets the company’s requirements. Once it is
displaying the correct format, the participants may move on. Next, the participants will begin the
coding process for the console application using textpad. Once they have entered the code, they
will compile the program to check for any errors which may exist. If any errors are existent, they
will have to debug until the program compiles correctly. Once it has compiled, the team will
have to test various sets of input data to be sure the program is producing the correct output in
the correct format, as well as that it is not accepting invalid data types. If these stipulations are
not met during the testing stage, they will have to go back and check the coding and correct it so
it will function properly.

Next, the teams will enter phase three of the simulation. During this phase, they will
create a web driven applet. To begin this phase, they will create a storyboard which will be a
graphical layout of how the applet will appear to the user. Once they have created the
storyboard, the participants will return to the vice president of the company for approval of the
layout. If the storyboard meets the company’s specifications, the team will move onto the
coding process, and if not, they will have to redo the layout until it is acceptable. Next, they
will code the program for the web driven applet using textpad. After entering the code, they will
compile the program. If any errors exist, they will have to debug until the compilation is
successful. Once the compilation is successful, the participants will input various sets of data to
be sure the applet is functioning and providing the same accurate output as the console
application. If it is not accurate, they will have to go back and proof the code, make necessary
changes, and retest until it functions accurately. Once the output of the applet is correct, the
teams will move to phase four.
Phase four will be the final phase of the simulation process. First the teams will have to be sure all files created during the phases are saved and have descriptive filenames. After all files are stored electronically, they will have to print hardcopies of each one to produce the appropriate programming documentation. They will bind the hardcopies together to create a professional portfolio for submission to the vice president of the company. Next, each team will prepare a presentation to exhibit their final creations to the vice president of the company. After the presentations are prepared, each team will be asked to present them in a professional manner. During their presentations, the programming teams will be evaluated on how well they followed the programming cycle and the functionality of their applications, their presentation skills, and their documentation skills. This will close the process and events of the final assessment simulation for the java course (see appendix C for the simulation phase requirements).

**Model of the Simulation:**

The model of the simulation displays the flow of events throughout the simulation process. The model exhibits all events for the beginning of phase one in the simulation to the end of phase four. It also depicts the points during the process where the simulation teams may make errors during the phases and have to revisit prior steps to correct the problems (see appendix D for the model of the simulation).

**Consequences:**

The consequences of the simulation are dependent upon how well the participants perform during the following simulation processes: requesting data needed to complete various phases, creating graphical representations for each program, creating the required programs
which perform the required functions and produces accurate output, professionally documenting all files electronically and hardcopy which were created during the process, and presenting the information to the vice president. The participants must complete each portion of the simulation satisfactorily from the design phase to the demonstration of the programs. A letter grade will be awarded to them for their final assessment project in the java programming course. Each team member will be required to have equal contribution in all of the phases of the simulation. The final project assessment simulation counts as thirty percent of their overall course grade (see appendix E for the simulation evaluation rubric). If the performance levels are low, it can result in a lower course grade which in turn will affect their overall curricular GPA. If their performance is at an extremely low level, it can result in the participants having to repeat the entire course as a requirement for the completion of their information technology degree.

**Resources:**

Being that the simulation for the java course takes place in a community college environment, there are no constraints to obtaining the recourses to carry out the simulation procedures. The following are resources needed for the simulation:

- Classroom for prep and presentation
- Computers for each participant and instructor
- Java Textbooks
- USB drives for each participant
- Textpad software on each computer
- Internet access on each computer
- Microsoft Word for each computer
✓ Projector/Projector screen

✓ Report Portfolios
APPENDIX
# APPENDIX A

## COURSE OVERVIEW

<table>
<thead>
<tr>
<th>WEEK</th>
<th>TOPICS COVERED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks 1-2</td>
<td><strong>Intro to Java Programming</strong></td>
</tr>
<tr>
<td></td>
<td>- Types of Java Programs</td>
</tr>
<tr>
<td></td>
<td>- Program Development Cycle</td>
</tr>
<tr>
<td></td>
<td>- Object Oriented Programming</td>
</tr>
<tr>
<td>Weeks 3-6</td>
<td><strong>Creating of Java Applications/Applets</strong></td>
</tr>
<tr>
<td></td>
<td>- Using Textpad</td>
</tr>
<tr>
<td></td>
<td>- Coding Programs</td>
</tr>
<tr>
<td></td>
<td>- Testing Programs</td>
</tr>
<tr>
<td></td>
<td>- Debugging Programs</td>
</tr>
<tr>
<td></td>
<td>- Running Programs</td>
</tr>
<tr>
<td>Weeks 7-9</td>
<td><strong>Utilizing Methods in Programs</strong></td>
</tr>
<tr>
<td></td>
<td>- Using Operators (Logical, Arithmetic)</td>
</tr>
<tr>
<td></td>
<td>- Using Expressions</td>
</tr>
<tr>
<td></td>
<td>- Programming Output</td>
</tr>
<tr>
<td>Weeks 10-12</td>
<td><strong>Utilizing Reusable Objects and Decision Making</strong></td>
</tr>
<tr>
<td></td>
<td>- Writing Methods</td>
</tr>
<tr>
<td></td>
<td>- Using the If/Else in Programs</td>
</tr>
<tr>
<td></td>
<td>- Handling Input Errors</td>
</tr>
<tr>
<td></td>
<td>- Formatting Output</td>
</tr>
<tr>
<td>Weeks 13-15</td>
<td><strong>Final Assessment Simulation</strong></td>
</tr>
<tr>
<td></td>
<td>- Students will be paired together to form programming teams to work on their</td>
</tr>
<tr>
<td></td>
<td>final assessment which will be a three week simulation as a programming team.</td>
</tr>
</tbody>
</table>


## APPENDIX B

### REQUEST FOR NEW APPLICATION

<table>
<thead>
<tr>
<th>Date Submitted:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Submitted by:</td>
<td>Kelley A. Barnes, Vice President, Friendly Fitness Equipment</td>
</tr>
<tr>
<td>Purpose:</td>
<td>The sales department at Friendly Fitness Equipment needs an application to calculate and determine sales commission for the company’s associates based on the type of sales.</td>
</tr>
<tr>
<td>Application Title:</td>
<td>Friendly Fitness Commission Calculator</td>
</tr>
<tr>
<td>Algorithms:</td>
<td>The users need to be able to enter the type of sales, as well as the sales amount. Upon entering this information, the calculator should display the total commission amount for that individual sale.</td>
</tr>
</tbody>
</table>
| Notes:          | 1. The calculator needs to have a feature which requires the user to enter valid information.  
2. The user should be able to exit the application at any time by choosing cancel.  
3. The stand-alone application should incorporate dialog boxes which prompt for user input and display the final output.  
4. The applet should display the company logo and colors. |
## APPENDIX C

### SIMULATION PHASE REQUIREMENTS

| PHASE 1 | ✓ Scenario is provided to participants  
✓ Requirements document is provided to participants  
✓ Participants must review the requirements document  
✓ Participants may request other information they may need to move to phase 2 of the simulation |
| --- | --- |
| PHASE 2 | ✓ Programming teams create the console application flowchart  
✓ Programming teams code the program for the console application based on the flowchart  
✓ Programming teams compile the code and debug as needed  
✓ Programming teams run the console application and test it with various sets of input data  
✓ Programming teams verify the output of the console application is correct, then move to phase 3 |
| PHASE 3 | ✓ Programming teams create the storyboard for the applet application  
✓ Programming teams code the program for the applet application  
✓ Programming teams compile the code and debug as needed  
✓ Programming teams run the applet application and test with various sets of input data  
✓ Programming teams verify the output of the console application is correct, then move to phase 4 |
| PHASE 4 | ✓ Create descriptive filenames for each file created for the phases of the programming cycle and save  
✓ Print hardcopies of all documentation created during the phases of the programming cycle and put into a portfolio  
✓ Prepare a presentation for the final assessment of the programs  
✓ Present to the vice president of the company demonstrating the flow and functions of both applications |
APPENDIX D

Simulation Model

(BEGIN)
Provide Requirement Document

Document Reviewed my Programming Team

Participants Return to VP and Request additional info.

Sketch and Create Flowchart in Word and Ok with VP

Code Console Application

Compile Console

Debug code

Proof and revise code structure

Enter Test Data

Create Storyboard and ok with VP

Correct and return to VP for approval

Code Applet

Compile Applet

Debug Code

Proof and revise code structure

Enter Test Data

ERROR

OK

ERROR

OK

ERROR

OK

ERROR

OK

ERROR

OK

ERROR

OK

ERROR

OK

ERROR

OK

END)

Present Application to the VP for Final Assessment of Each Java Program

Prepare a professional presentation to present the final products to the VP of the company

Print a hard copy of each file created for proper documentation

Save all Files with Descriptive Names
## APPENDIX E

### Java Programming I Final Assessment Simulation Rubric

<table>
<thead>
<tr>
<th>Participant Names:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>TASK</th>
<th>POSSIBLE POINTS</th>
<th>SCORING</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creation of graphical flowchart for console application using Microsoft Word</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Console Application:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Complies Correctly free of errors</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Entry of test data provides correct output based on program requirements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creation of storyboard for the applet application using Microsoft Word</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Applet:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Complies correctly free of errors</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Entry of test data provides correct output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Presentation Skills:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Presented well in class using eye contact</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Presented all information required for simulation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Created a portfolio including all documentation created throughout the programming cycle</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SIMULATION SCORE IS:** OUT OF 100 POSSIBLE POINTS

21