Object Oriented Programming with Design Patterns

Information and Communications Technology

Course Number:	Co-Requisites:	Pre-Requisites:
CST8288	CST2234	CST8282 or CST8215 and CST8284
Applicable Program(s):	**AAL:**	**Core/Elective:**
0336X01FWO - Computer Programmer	3	Core
0336X03FWO - Computer Programmer	3	Core
Prepared by:	Shahriar Emami, Instructor	
Approved by:	Andrew Pridham, Academic Chair, ICT	
Approval Date:	Wednesday, August 29, 2018	
Approved for Academic Year:	2018-2019	
Normative Hours:	60.00	

Course Description

Implement the best practices of object oriented program development with software design patterns. Apply UML program specifications in the Java programming language. Use embedded SQL through JDBC for developing and using "data access objects". Course topics include refactoring, domain modelling, JDBC and multithreaded servlet programming. Students develop proficiency in creating, testing, debugging, deploying and documenting programs and servlets through practical application.

Relationship to Vocational Learning Outcomes

This course contributes to your program by helping you achieve the following Vocational Learning Outcomes:

0336X01FWO - Computer Programmer

VLO 1	Use documented solutions to troubleshoot problems associated with software installation and customization. (T, A,)
VLO 2	Develop, test, document, deploy, and maintain secure program code based on specifications. (T, A,)
VLO 3	Perform routine maintenance on a database. (T, A,)
VLO 4	Apply knowledge of networking concepts to develop, deploy, and maintain program code. (T, A,)
VLO 6	Use relevant methodologies, policies, and standards to develop secure program code. (T, A,)

VLO 8	Conform to workplace expectations found in information technology (IT) environments. (T, A,)

0336X03FWO - Computer Programmer

VLO 1	Use documented solutions to troubleshoot problems associated with software installation and customization. (T, A,)
VLO 2	Develop, test, document, deploy, and maintain secure program code based on specifications. (T, A,)
VLO 3	Perform routine maintenance on a database. (T, A,)
VLO 4	Apply knowledge of networking concepts to develop, deploy, and maintain program code. (T, A,)
VLO 6	Use relevant methodologies, policies, and standards to develop secure program code. (T, A,)
VLO 8	Conform to workplace expectations found in information technology (IT) environments. (T, A,)

Relationship to Essential Employability Skills

This course contributes to your program by helping you achieve the following Essential Employability Skills:

EES 2	Respond to written, spoken or visual messages in a manner that ensures effective communication. (A,)
EES 3	Execute mathematical operations accurately. (A,)
EES 4	Apply a systematic approach to solve problems. (A,)
EES 5	Use a variety of thinking skills to anticipate and solve problems. (A,)
EES 7	Analyze, evaluate and apply relevant information from a variety of sources. (T, A,)
EES 9	Interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals. (T, A,)
EES 10	Manage the use of time and other resources to complete projects. (A,)
EES 11	Take responsibility for one's own actions, decisions and consequences. (A,)

Course Learning Requirements/Embedded Knowledge and Skills

When you have earned credit for this course, you will have demonstrated the ability to:

1.) Implement an objected-oriented program design incorporating the use of best practice design patterns using the JAVA programming language.

Implement UML documented specifications in the JAVA language.

Decompose specifications into UML diagrams showing a hierarchy of packages, classes, and methods showing both static and dynamic relationships (inheritance, object interactions), object compostion and behavior.

Model processing sequences using UML object diagrams.

Select and/or extend appropriate built-in classes.

Write both class and interface definitions as required.

Apply thru practical application the following design patterns/strategies: Singleton (including a thread-safe singleton), Simple Factory, Builder, Telescoping Constructors, Delegate, Observer, MVC, Get/Set, Adapter, Value Object, Dependent Object, Command Pattern.

2.) Understand multithreading concepts related to thread-safe Java Servlet programming.

Develop a Java application using server side technology which consists of thread-safe Java Servlet(s).

Apply thread-safe programming concepts within the context of Java Servlet programming.

3.) develop a GUI application using JavaFX

use oop concept introduced to optimise and organize the application

implementation of a multithreaded gui application using tools such as ExecutorService, Thread and AnimationTimer

4.) Develop a Java application that accesses a database using a best practice Data Access Object (DAO) design pattern requiring the extension of an existing framework based DAO collection of classes and interfaces.

Develop Java code that manipulates a database (Oracle, MySQL, or other main stream database management system) using JDBC and the DAO Command Bean design pattern.

Develop Java code which uses Java database drivers and driver types, database connections, database meta data, database features, supported SQL statement types, and result sets as supported by JDBC.

5.) Develop web applications using Java

Design a web based Java application using both sever-side and client-side programming.

Design and implement Java code which uses the servlet interface and the servlet life cycle.

Set up a standalone version of the Apache Tomcat servlet engine.

6.) As part of a team design and develop the domain layer software components in the Java programming language based on a provided case study.

Develop a UML use case diagram, class diagram, and sequence diagram depicting the design of the case study domain layer.

Design your domain layer such that it includes a minimum of four established design patterns in addition to the Builder design pattern.

Provide in the design the necessary links/connections to both the presentation layer and data management layers.

Apply a "controller class" to manage communication and processing between the presentation, domain, and data management layers in the case study design.

Implement the design in the Java programming language using both Java classes and Java interfaces.

7.) As part of a team, develop a Java application designed with multiple layers and tiers utilizing the minimum of a Web Browser presentation layer, Java Servlet serverside objects, and a Database server component. The design must be based on the provided case study.

Develop a multi-tiered architectue and associated components in the design and implementation of a Java based application using bother client and server side technologies.

Develop a UML class diagram and deployment diagram depicting the design of the multi-tiered Java application.

Develop multi-tiered Java code which utilize multi-threading concepts within Java Servlets that implements your design.

Extend a framework for implementing the data access object design pattern.

Learning Resources

Recommended Textbook:

Java How to Program, 10th Edition, by Deitel and Deitel, Published by Pearson Education Inc. in 2015 ISBN: 978-0-13-380780-6

Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides. (1994). *Design Patterns: Elements of Reusable Object-Oriented Software*. Addison-Wesley Professional. ISBN-13: 978-0-201-63361-0 (Available in Safari Books through school library)

James W. Cooper. (2000). Java(TM) *Design Patterns: A Tutorial.* Addison-Wesley Professional. ISBN-13: 978-0-201-48539-4 (Available in Safari Books through school library)

Required Hardware:

This course is part of the mobile (laptop) program initiative at Algonquin College. Students are required to have a functioning laptop at all lecture and lab classes. The specifications for the required laptop and additional information about the mobile program initiative can be found at http://mlearning.algonquincollege.com.

Required Software:

Java Platform (JDK) 8u45 (or later)
http://www.oracle.com/technetwork/java/javase/downloads/index.html

(Optional) Eclipse Luna IDE version 4.4.2 (or later)
http://www.eclipse.org/downloads/

(Optional) Netbeans IDE version 8.0.2 (or later) (download the Java EE Bundle)*
https://netbeans.org/downloads/
* Bundle includes Apache Tomcat 8.0.15

JUnit Testing Framework junit4.xx

http://junit.org/

MySql 5.6 Community Server (or later)
http://dev.mysql.com/downloads/

Apache Tomcat version 8.0.15 (or later) **
https://tomcat.apache.org/download-80.cgi

Learning Activities

Classroom Lectures
Lab exercises
Assignments
Team Projects
Practical and reading assignments
Research of course-related material

Evaluation/Earning Credit

The following list provides evidence of this course's learning achievements and the outcomes they validate:

Midterm Exam(s) (20%)

Validates Outcomes: CLR 1, CLR 2, CLR 3, CLR 4, CLR 5, CLR 7, EES 3, EES 4, EES 5

Final Exam (25%)

Validates Outcomes: CLR 1, CLR 2, CLR 3, CLR 4, CLR 5, CLR 6, CLR 7, EES 3, EES 4, EES 5

Quiz(zes)/Test(s) (5%)

Validates Outcomes: CLR 1, CLR 2, CLR 3, CLR 4, CLR 5, EES 3, EES 4, EES 5

Lab Activity(ies) (10%)

Validates Outcomes: CLR 1, CLR 2, CLR 3, CLR 4, CLR 5, CLR 7, EES 2, EES 3, EES 4, EES 5, EES 7, EES 10, EES 11

Assignment(s) (40%)

Validates Outcomes: CLR 1, CLR 2, CLR 3, CLR 4, CLR 5, CLR 6, CLR 7, EES 2, EES 3, EES 4, EES 5, EES 7, EES 9, EES 10, EES 11

Students are expected to meet evaluation and completion deadlines as stated in course outline and course section information documents. In circumstances where evaluation and/or completion deadlines are missed or student performance has been affected by a temporary or permanent disability (including mental health), interim or retroactive accommodations may be considered. In such instances, please consult your course faculty member. For other situations where deferral of evaluations may be warranted, please refer to college policy AA21.

Prior Learning Assessment and Recognition

Students who wish to apply for prior learning assessment and recognition (PLAR) need to demonstrate competency at a post-secondary level in all of the course learning requirements outlined above. Evidence of learning achievement for PLAR candidates includes:

- Portfolio
- Challenge Exam
- Project/Assignment

Grade Scheme

Final Grade	Mark Equivalent	Numeric Value	Final Grade	Mark Equivalent	Numeric Value
A+	90% - 100%	4.0	A	85% - 89%	3.8
A-	80% - 84%	3.6	B+	77% - 79%	3.3
B	73% - 76%	3.0	B-	70% - 72%	2.7
C+	67% - 69%	2.3	C	63% - 66%	2.0
C-	60% - 62%	1.7	D+	57% - 59%	1.4
D	53% - 56%	1.2	D-	50% - 52%	1.0
F	0% - 49%	0	FSP	0	0

Course Related Information

In order to pass the course, the student must have a grade of at least 50% (or “D-”) on the sum of midterm test(s), final exam and quizzes, as well as on the practical component (labs and assignments).

Lab exercises and assignments will not be included in the final grade unless the student achieves at least a grade of 50% or “D-” on the combined midterm(s) and final assessment. (Students who have a failing grade on the combined tests and the exam will receive a grade of “F”.)

Team work is required and will be assessed both on an individual performance and participation level, non-participation may result in full loss of marks for the associated team assignment.

Assignments must be submitted by the due date. Incomplete assignments will be accepted when they are due and will be eligible for appropriate partial marks. Late assignments will receive a grade of zero.

All students are required to write the final exam. There are no provisions for “making up” a missed final exam. If, as a result of being off-track in your program or some unforeseen circumstance, you note that there is a scheduling conflict in your final exam schedule, it is your responsibility to alert your course professor no later than one week before final exams start, to allow for any special arrangements.

Department Related Information

STUDENT ACADEMIC RESPONSIBILITIES

Each student is responsible for:
• Knowing the due dates for marked out-of-class assignments.
• Attending all classes and knowing the dates of in-class marked assignments and exercises.
• Maintaining a folder of all work done in the course during the semester for validation claims in cases of disagreement with faculty.
• Keeping both paper and electronic copies of all assignments, marked and unmarked, in case papers are lost or go missing.
• Regularly checking both Blackboard announcements as well as one's Algonquin e-mail account for important messages from both professors and college administration.
• Participating in on-line and classroom exercises and activities as required.
• Retaining course outlines for possible future use to support applications for transfer of credit to other educational institutions.

Harassment/Discrimination/Violence will not be tolerated. Any form of harassment (sexual, racial, gender or disability-related), discrimination (direct or indirect), or violence, whether involving a professor and a student or amongst students, will not be tolerated on the college premises. Action taken will start with a formal warning and proceed to the full disciplinary actions as outlined in Algonquin College Policies - HR22 and SA07.
Harassment means one or a series of vexatious comment(s) (whether done verbally or through electronic means), or conduct related to one or more of the prohibited grounds that is known or ought reasonably to be known to be unwelcome/unwanted, offensive, intimidating, derogatory or hostile. This may include, but is not limited to: gestures, remarks, jokes, taunting, innuendo, display of offensive materials, offensive graffiti, threats, verbal or physical assault, stalking, slurs, shunning or exclusion related to the prohibited grounds.

For further information, a copy of the official policy statement can be obtained from the Student Association.

Violation of the Copyright Act

General – The Copyright Act makes it an offence to reproduce or distribute, in whatever format, any part of a publication without the prior written permission of the publisher. For complete details, see the Government of Canada website at http://laws.justice.gc.ca/en/C-42 . Make sure you give it due consideration, before deciding not to purchase a textbook or material required for your course.

Software Piracy - The Copyright Act has been updated to include software products. Be sure to carefully read the licensing agreement of any product you purchase or download, and understand the terms and conditions covering its use, installation and distribution (where applicable). Any infringement of licensing agreement makes you liable under the law.

Disruptive Behaviour is any conduct, or threatened conduct, that is disruptive to the learning process or that interferes with the well being of other members of the College community. It will not be tolerated. Members of the College community, both students and staff, have the right to learn and work in a secure and productive environment. The College will make every effort to protect that right. Incidents of disruptive behaviour must be reported in writing to the departmental Chair as quickly as possible. The Chair will hold a hearing to review available information and determine any sanctions that will be imposed. Disciplinary hearings can result in penalties ranging from a written warning to expulsion.

For further details, consult the Algonquin College Policies AA32, SA07 and IT01 in your Instaguide.

College Related Information

Email

Algonquin College provides all full-time students with an e-mail account. This is the address that will be used when the College, your professors, or your fellow students communicate important information about your program or course events. It is your responsibility to ensure that you know how to send and receive e-mail using your Algonquin account and to check it regularly.

Students with Disabilities

If you are a student with a disability, you are strongly encouraged to make an appointment at the Centre for Accessible Learning to identify your needs. Ideally, this should be done within the first month of your program, so that a Letter of Accommodation (LOA) can be provided to your professors. If you are a returning student, please ensure that professors are given a copy of your LOA each semester.

Retroactive Accommodations

Students are expected to meet evaluation and completion deadlines as stated in course outline and course section information documents. In circumstances where evaluation and/or completion deadlines are missed or student performance has been affected by a temporary or permanent disability (including mental health), interim or retroactive accommodations may be considered. In such instances, please consult your course faculty member. For other situations where deferral of evaluations may be warranted, please refer to college policy AA21.

Academic Integrity & Plagiarism

Adherence to acceptable standards of academic honesty is an important aspect of the learning process at Algonquin College. Academic work submitted by a student is evaluated on the assumption that the work presented by the student is his or her own, unless designated otherwise. For further details consult Algonquin College Policies AA18: Academic Dishonesty and Discipline and AA20: Plagiarism

Student Course Feedback

It is Algonquin College's policy to give students the opportunity to share their course experience by completing a student course feedback survey for each course they take. For further details consult Algonquin College Policy AA25: Student Course Feedback

Use of Electronic Devices in Class

With the proliferation of small, personal electronic devices used for communications and data storage, Algonquin College believes there is a need to address their use during classes and examinations. During classes, the use of such devices is disruptive and disrespectful to others. During examinations, the use of such devices may facilitate cheating. For further details consult Algonquin College Policy AA32: Use of Electronic Devices in Class

Transfer of Credit

It is the student's responsibility to retain course outlines for possible future use to support applications for transfer of credit to other educational institutions.

Note: *It is the student's responsibility to refer to the Algonquin College Policies website for the most current information at http://www.algonquincollege.com/policies/*

Legend

Terms

•ALO: Aboriginal Learning Outcome
•Apprenticeship LO: Apprenticeship Learning Outcome
•CLR: Course Learning Requirement
•DPLO: Degree Program Learning Outcome
•EES: Essential Employability Skill
•EOP: Element of Performance
•GELO: General Education Learning Outcome
•LO: Learning Outcome
•PC: Program Competency
•PLA: Prior Learning Assessment
•PLAR: Prior Learning Assessment and Recognition
•VLO: Vocational Learning Outcome

Assessment Levels

•T: Taught
•A: Assessed
•CP: Culminating Performance