CSD-4503 DevOps: Tools and Practices

Computer Studies

Course Number:	**Co-Requisites:**	**Pre-Requisites:**
CSD-4503	N/A	CSD-4203
Prepared by:	Aaron Sarson, Coordinator	
Approved by:	Chris Slade, Senior Dean	
Approval Date:	Friday, June 16, 2023	
Approved for Academic Year:	2023-2024	
Credit Weight:	3.00	

Course Description

Modern software development is done with a high degree of velocity, often with software changes being released multiple times daily or weekly. This course introduces students to industry-standard tools and techniques that help manage the development and release of such software using Agile methodologies and DevOps principles. Students (1) evaluate technical and business background details related to DevOps;(2) evaluate Cloud platforms as a deployment option for applications; (3) evaluate responsibilities of operations teams and get familiar with their day-to-day operations;(4) evaluate CI/CD pipelines and their components and discuss micro-service architecture;(5) evaluate containers and containerization as the most up-to-date application delivery method. Throughout the term, students work in teams on a term project, to develop and deploy software with evolving requirements. Students will document these changes based on Software Requirement Specification standards.

Course Learning Outcomes/Course Objectives

1. **Evaluate technical and business background of DevOps**
   - 1.1 Describe DevOps
   - 1.2 Discuss why DevOps is needed
   - 1.3 Discuss DevOps perspective
   - 1.4 Discuss the connection between DevOps and Agile
   - 1.5 Discuss Team structure
   - 1.6 Discuss coordination
   - 1.7 Discuss barriers to DevOps

2. **Evaluate Cloud as a platform**
   - 2.1 Discuss Cloud Computing

2.2 Discuss Features of the Cloud

2.3 Discuss DevOps consequences of the unique cloud features

3. Evaluate Operations

3.1 Discuss Operation

3.2 Discuss Operations Services

3.3 Discuss Service Operation Functions

3.4 Discuss Continual Service Improvement

3.5 Explore Operations and DevOps

4. Evaluate Deployment Pipelines

4.1 Explore the Role of Environment in Application Delivery

4.2 Discuss Virtualization and Containerization

4.3 Discuss Containerization and DevOps

4.4 Explore Installation and Configuration of Containers

4.5 Explore Practical Aspects of Containerization

4.6 Explore Container Deployment and Orchestration

4.7 Examine Container Orchestration

Relationship to Essential Employability Skills

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

EES 1.1	Communicate clearly, concisely and correctly in the written, spoken and visual form that fulfills the purpose and meets the needs of the audience. (A,)
EES 1.2	Respond to written, spoken or visual messages in a manner that ensures effective communication. (A,)
EES 3.4	Apply a systematic approach to solve problems. (T, A,)
EES 3.5	Use a variety of thinking skills to anticipate and solve problems. (T, A,)
EES 4.6	Locate, select, organize and document information using appropriate technology and information systems. (T, A,)
EES 4.7	Analyze, evaluate and apply relevant information from a variety of sources. (A,)
EES 5.8	Show respect for diverse opinions, values, belief systems and contributions of others. (A,)
EES 5.9	Interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals. (A,)
EES 6.10	Manage the use of time and other resources to complete projects. (A,)
EES 6.11	Take responsibility for one's own actions, decisions and consequences. (A,)

Relationship to Vocational Learning Outcomes

This course provides the opportunity for you to achieve the following Program Vocational Learning Outcomes (VLO's), which will be taught and evaluated at a taught (T), assessed (A) or culminating performance (CP) level:

CPCM - Computer Programmer

VLO 1	Identify, analyze, develop, implement, verify and document the requirements for a computing environment. (T, A)
VLO 4	Implement robust computing system solutions through validation testing that aligns with industry best practices. (T, A)
VLO 5	Communicate and collaborate with team members and stakeholders to ensure effective working relationships. (T, A)
VLO 6	Select and apply strategies for personal and professional development to enhance work performance. (T, A)
VLO 7	Apply project management principles and tools when working on projects within a computing environment. (T, A)
VLO 9	Support the analysis and definition of software system specifications based on functional and non-functional requirements. (T, A)
VLO 10	Contribute to the development, documentation, implementation, maintenance and testing of software systems by using industry standard software development methodologies based on defined specifications and existing technologies/frameworks. (T, A)
VLO 11	Apply one or more programming paradigms such as, object-oriented, structured or functional programming, and design principles, as well as documented requirements, to the software development process. (T, A)

CPCT - Computer Programmer

VLO 1	Identify, analyze, develop, implement, verify and document the requirements for a computing environment. (T, A)
VLO 4	Implement robust computing system solutions through validation testing that aligns with industry best practices. (T, A)
VLO 5	Communicate and collaborate with team members and stakeholders to ensure effective working relationships (T, A)
VLO 6	Select and apply strategies for personal and professional development to enhance work performance. (T, A)
VLO 7	Apply project management principles and tools when working on projects within a computing environment. (T, A)
VLO 9	Support the analysis and definition of software system specifications based on functional and non-functional requirements. (T, A)
VLO 10	Contribute to the development, documentation, implementation, maintenance and testing of software systems by using industry standard software development methodologies based on defined specifications and existing technologies/frameworks. (T, A)
VLO 11	Apply one or more programming paradigms such as, object-oriented, structured or functional programming, and design principles, as well as documented requirements, to the software development process. (T, A)

CPRO - Computer Programmer

VLO 1	Identify, analyze, develop, implement, verify and document the requirements for a computing environment. (T, A)
VLO 4	Implement robust computing system solutions through validation testing that aligns with industry best practices. (T, A)

VLO 5	Communicate and collaborate with team members and stakeholders to ensure effective working relationships. (T, A)
VLO 6	Select and apply strategies for personal and professional development to enhance work performance. (T, A)
VLO 7	Apply project management principles and tools when working on projects within a computing environment. (T, A)
VLO 9	Support the analysis and definition of software system specifications based on functional and non-functional requirements. (T, A)
VLO 10	Contribute to the development, documentation, implementation, maintenance and testing of software systems by using industry standard software development methodologies based on defined specifications and existing technologies/frameworks. (T, A)
VLO 11	Apply one or more programming paradigms such as, object-oriented, structured or functional programming, and design principles, as well as documented requirements, to the software development process. (T, A)

CSAC - Computer Software and Database Development

VLO 1	Evaluate system requirements and implement multi-tiered (client, server, and database) web applications to meet client requirements. (T, A)
VLO 4	Evaluate and integrate security features into the client and database application tiers to secure against system threats. (T, A)
VLO 5	Integrate software applications for teams to collaborate and control the outcomes of a project. (T, A)

FSDM - Full Stack Software Development

VLO 1	Evaluate system requirements and implement full stack (client, server, and database) web applications to meet client requirements. (T, A)
VLO 4	Integrate software applications/tools for teams to collaborate and control the outcomes of a project. (T, A)
VLO 5	Select, apply, and implement software applications adhering to industry standard architectural patterns (i.e. MVC, Microservice, Client-Server) commonly used to develop full stack software applications. (T, A)

FSDO - Full Stack Software Development

VLO 1	Evaluate system requirements and implement full stack (client, server, and database) web applications to meet client requirements. (T, A)
VLO 4	Integrate software applications/tools for teams to collaborate and control the outcomes of a project. (T, A)
VLO 5	Select, apply, and implement software applications adhering to industry standard architectural patterns (i.e. MVC, Microservice, Client-Server) commonly used to develop full stack software applications. (T, A)

FSDS - Full Stack Software Development

VLO 1	Evaluate system requirements and implement full stack (client, server, and database) web applications to meet client requirements. (T, A)
VLO 4	Integrate software applications/tools for teams to collaborate and control the outcomes of a project. (T, A)
VLO 5	Select, apply, and implement software applications adhering to industry standard architectural patterns (i.e. MVC, Microservice, Client-Server) commonly used to develop full stack software applications. (T, A)

FSDT - Full Stack Software Development

VLO 1	Evaluate system requirements and implement full stack (client, server, and database) web applications to meet client requirements. (T, A)
VLO 4	Integrate software applications/tools for teams to collaborate and control the outcomes of a project. (T, A)
VLO 5	Select, apply, and implement software applications adhering to industry standard architectural patterns (i.e. MVC, Microservice, Client-Server) commonly used to develop full stack software applications. (T, A)

Learning Resources

Recommended:

Len Bass, Ingo Weber, Liming Zhu (2015). DevOps: a software architect's perspective. [ISBN:978-0-13-404984-7]

Sean Kane, Karl Matthias (2018). Docker: Up & Running: Shipping Reliable Containers in Production. [ISBN: 978-1492036739]

Student Evaluation

1 Test - 30%
Term Project - 40%
4 Assignments @ 5% - 20%
Blog Post - 10%

Grade Scheme

The round off mathematical principle will be used. Percentages are converted to letter grades and grade points as follows:

Mark (%)	Grade	Grade Point	Mark (%)	Grade	Grade Point
94-100	A+	4.0	67-69	C+	2.3
87-93	A	3.7	63-66	C	2.0
80-86	A-	3.5	60-62	C-	1.7
77-79	B+	3.2	50-59	D	1.0
73-76	B	3.0	0-49	F	0.0
70-72	B-	2.7			

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:

- Not Applicable: Post graduate course and not eligible for PLAR

Course Related Information

Refer to Program Related Information

Program Related Information

CPRO - Computer Programmer

Program policies pertaining to CSD courses in the CPRO and CSAC programs are posted in D2L for all CSD courses. These policies explain the waiver option as well as policies related to evaluations and classroom conduct. Students are expected to be aware and abide by these policies.

CSAC - Computer Software and Database Development

Program policies pertaining to CSD courses in the CPRO and CSAC programs are posted in D2L for all CSD courses. These policies explain the waiver option as well as policies related to evaluations and classroom conduct. Students are expected to be aware and abide by these policies.

College Related Information

Note: 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.

Academic Integrity

Lambton College is committed to high ethical standards in all academic activities within the College, including research, reporting and learning assessment (e.g. tests, lab reports, essays).
The cornerstone of academic integrity and professional reputation is principled conduct. All scholastic and academic activity must be free of all forms of academic dishonesty, including copying, plagiarism and cheating.

Lambton College will not tolerate any academic dishonesty, a position reflected in Lambton College policies. Students should be familiar with the Students Rights and Responsibilities Policy, located at lambtoncollege.ca. The policy states details concerning academic dishonesty and the penalties for dishonesty and unethical conduct.

Questions regarding this policy, or requests for additional clarification, should be directed to the Lambton College Student Success Department.

Students with Disabilities

If you are a student with a disability please identify your needs to the professor and/or the Accessibility Centre so that support services can be arranged for you. You can do this by making an appointment at the Accessibility Centre or by arranging a personal interview with the professor to discuss your needs.
Lambton College in Toronto at Cestar College Campus and Lambton College in Mississauga at Queen's College Campus, please identify your needs to the professor and/or student services.

Student Rights and Responsibility Policy

Acceptable behaviour in class is established by the instructor and is expected of all students. Any form of misbehaviour, harassment or violence will not be tolerated. Action will be taken as outlined in Lambton College policy.

Date of Withdrawal without Academic Penalty

Please consult the Academic Regulations and Registrar's published dates.

Waiver of Responsibility

Every attempt has been made to ensure the accuracy of this information as of the date of publication. The content may be modified, without notice, as deemed appropriate by the College.

Students should note policies may differ depending on the location of course offering. Please refer to your study location specific policies:

LAMBTON COLLEGE POLICIES - applicable to all Lambton College students:

- Student Rights & Responsibilities & Discipline policy (2000-5-1)
- Test & Exam Writing Protocol (2000-1-6)
- Evaluation of Students (2000-1-3)
- Policy Link - https://www.lambtoncollege.ca/custom/Pages/Policies/Policies.aspx

CESTAR COLLEGE:

- www.lambtoncollege.ca/policies-tor

QUEENS COLLEGE:

- www.lambtoncollege.ca/policies-miss