



CST2355

Database Systems

Course Outline

2022-2023

Pre-requisite(s)	CST8215
Co-requisite(s)	N/A
Prepared by	Douglas King
Approved by	Sandra Brancatelli, M.Eng., P.Eng., Academic Chair, ICT-Applications & Programming
Normative hours	56.00
Grading system	A+ Through F
Experiential Learning	No

Applicable Program(s)	Level	Core/Elective
0336X01FWO - Computer Programming	2	Core
0336X03FWO - Computer Programming	2	Core
0336X07PAO - Computer Programming	2	Core
0336X09FAO - Computer Programming	2	Core
1561X01FWO - Computer Programming and Analysis	2	Core
1561X03FWO - Computer Programming and Analysis	2	Core

Course Description

Database systems can automate data processing tasks as well as tie into the security of information technology systems. Students acquire practical experience using market-leading object-relational database management systems like Oracle and MySQL. Students obtain hands-on experience with advanced engineering modeling tools along with SQL, SQL scripts and programming with Oracle's PL/SQL blocks. Database concepts covered include advanced SQL, case structures, rollup and cube operations, metadata manipulation, data storage and retrieval, security and transaction control and data warehousing

Vocational Learning Outcomes

This course provides the opportunity for you to achieve the following outcomes:

0336X01FWO - Computer Programming

VLO 1	Identify, analyze, develop, implement, verify and document the requirements for a computing environment. (T, A)
VLO 2	Contribute to the diagnostics, troubleshooting, documenting and monitoring of technical problems using appropriate methodologies and tools. (T, A)
VLO 3	Implement and maintain secure computing environments. (T)
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)
VLO 6	Select and apply strategies for personal and professional development to enhance work performance (T)

0336X03FWO - Computer Programming

VLO 1	Identify, analyze, develop, implement, verify and document the requirements for a computing environment. (T, A)
VLO 2	Contribute to the diagnostics, troubleshooting, documenting and monitoring of technical problems using appropriate methodologies and tools. (T, A)
VLO 3	Implement and maintain secure computing environments. (T)
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)
VLO 6	Select and apply strategies for personal and professional development to enhance work performance (T)

0336X07PAO - Computer Programming

VLO 1	Identify, analyze, develop, implement, verify and document the requirements for a computing environment. (T, A)
VLO 2	Contribute to the diagnostics, troubleshooting, documenting and monitoring of technical problems using appropriate methodologies and tools. (T, A)
VLO 3	Implement and maintain secure computing environments. (T)
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)

- VLO 6
- Select and apply strategies for personal and professional development to enhance work performance (T)

0336X09FAO - Computer Programming

- VLO 1
- Identify, analyze, develop, implement, verify and document the requirements for a computing environment. (T, A)
- VLO 2
- Contribute to the diagnostics, troubleshooting, documenting and monitoring of technical problems using appropriate methodologies and tools. (T, A)
- VLO 3
- Implement and maintain secure computing environments. (T)
- 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)
- VLO 6
- Select and apply strategies for personal and professional development to enhance work performance (T)

1561X01FWO - Computer Programming and Analysis

1561X03FWO - Computer Programming and Analysis

Assessment Levels —T: Taught A: Assessed CP: Culminating Performance

Essential Employability Skills

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

- EES 1
- Communicate clearly, concisely and correctly in the written, spoken and visual form that fulfills the purpose and meets the needs of the audience. (T, A)
- EES 2
- Respond to written, spoken or visual messages in a manner that ensures effective communication. (T, A)
- EES 3
- Execute mathematical operations accurately. (T, A)
- EES 4
- Apply a systematic approach to solve problems. (T, A)
- EES 5
- Use a variety of thinking skills to anticipate and solve problems. (T, A)
- EES 6
- Locate, select, organize and document information using appropriate technology and information systems. (T, A)
- EES 7
- Analyze, evaluate and apply relevant information from a variety of sources. (T, A)
- EES 8
- Show respect for diverse opinions, values, belief systems and contributions of others. (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. (T, A)
- EES 11
- Take responsibility for one's own actions, decisions and consequences. (T, A)

Assessment Levels —T: Taught A: Assessed CP: Culminating Performance

Course Learning Requirements / Embedded Knowledge and Skills

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

1. Plan, prepare, install, configure, and use a market-leading database management system, data modeling engineering tools, and open source software.
- Identify System Requirements and configuration for a MS Windows installation of Microsoft Access, Microsoft SQL Server, MySQL, and Oracle Enterprise Edition.

Implement and use a successful installation of Microsoft Access, Microsoft SQL Server, MySQL, and Oracle Enterprise Edition.

Use popular data modeling tools and consider the criteria relevant to choosing the proper one for a particular situation or organization.

Install and use the assigned data modeling tools (Microsoft Access, Microsoft SQL Server Management Studio, MySQL Workbench, and Oracle SQL Developer).

Install and use an open source database Management System (MySQL)
2. Apply advanced database design and normalization techniques.
- Use advanced concepts of the ER model and business rules to represent more complex applications using additional data modeling concepts.

Apply additional data modeling concepts of Enhanced ER (EER) model such as specialization/generalization.

Identify the problems associated with relations that break the rules of not only 1NF, 2NF, 3NF, 4NF, and 5NF, (including the relevance of Boyce-Codd normal form) and demonstrate how attributes are represented on a user interface or form based on these levels of normalized relations.
3. Use advanced SQL database language.
- Perform advanced SQL queries using techniques such as CASE structures, ROLLUP and CUBE operations.

Apply a full range of database objects and techniques, such as advanced table definitions and the creation of indexes, sequences, views, materialized views, and others.

Obtain database object metadata from the data dictionary.

Use Microsoft Access, Microsoft SQL Server Management Studio, MySQL Workbench, and Oracle SQL Developer tools to develop complex reports and control the database environment.
4. Use Oracle procedural programming language (PL/SQL) to write programs using SQL statements.
- Create programs using the structure of the PL/SQL Block, IN/OUT variables and defined types.

Create cursors, which allow PL/SQL to read the results returned by a query.

Develop triggers, to be run automatically when a certain event occurs in the database

Develop and use packages containing stored procedures and functions; including the use of built-in packages.
5. Develop advanced database queries.
- Use the ROLLUP and CUBE clauses to get subtotals and totals for groups of rows.

Create programs that take advantage of the analytic functions, which perform complex calculations, such as finding the top-selling product type for each month, the top salespersons, and so on.

Compare dimensional models versus traditional normalized relational models as a basis for analysis of overall trends in large amounts of data.
6. Create and modify users, privileges, and roles.

- Implement security controls to limit system privileges while performing actions such as executing DDL statements.
- Implement security controls in the form of object privileges to limit actions such as executing DML statements.
- Use database mechanisms to group privileges together into roles

7. Explain basic data warehousing concepts.

- Apply the basic concepts of data warehousing to data model creation.

Learning Resources

Required Laptop:

- This course is part of the Bring Your Own Device (laptop) program initiative at Algonquin College. Students are required to have a functioning laptop at all lecture and lab classes. To be successful in the course, it is imperative that the student has a laptop that meets the required hardware specification.
- Specifications for the required laptop and additional information about the mobile program initiative can be found at the program's web page.

Required Textbook:

- Database Processing: Fundamentals, Design, and Implementation, 16e
Kroenke, Auer, Vandenberg
Pearson
ISBN-13: 9780136930174

Required Software:

- Students will install and use a variety of relational database systems such as Microsoft Access, Microsoft SQL Server, MySQL, and Oracle Enterprise Edition and use the associated data modelling tools.

Learning Activities

Lectures (2 hours per week)
Labs (2 hours per week)

It is anticipated that you will need to spend an additional 4 hours per week, on average, for completing assignments, reviewing and/or studying.

During the course you are likely to experience:

Lectures: In-class time will focus of the prime theoretical material of the course. Students are expected to attend all classes. Students are encouraged to ask questions during lectures that solidify and expand knowledge related to the material being covered and to consult with the professor on topics which they do not clearly understand. The professor will inform students, at the beginning of the course, of suitable times for consultations. Laptop use during the lecture is permitted only with the instructors explicit permission, and only if used specifically and exclusively for lecture related material - they may not be used for other course work or recreational purposes during lecture or lab.

Labs: Students are expected to perform initial analysis and design before their scheduled lab, in order to take advantage of the limited lab time. Laboratory assignments will be closely integrated with the lecture material. A learner's ability to successfully complete the assigned exercises will directly correlate with their level of success on the final lab exam.

Pre-defined Evaluation / Earning Credit

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

Lab Activity(ies) (40%)

Validates Outcomes: CLR 1, CLR 2, CLR 3, CLR 4, CLR 5, CLR 6, CLR 7, EES 1, EES 2, EES 3, EES 4, EES 5, EES 6, EES 7, EES 8, EES 9, EES 10, EES 11

Midterm Exam(s) (30%)

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

Final Exam (30%)

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

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 outlined course learning requirements. Evidence of learning achievement for PLAR candidates includes:

- Portfolio
- Challenge Exam
- Performance Test

Other Information

Students are required to respect the confidentiality of employer, client and/or patient information, interactions, and practices that occur either on Algonquin College premises, or at an affiliated clinical/field/co-op placement site. Concerns regarding clients, patients, and/or employer practices are to be brought to the attention of the program coordinator, or designated field/clinical/co-op placement supervisor so that they may be resolved collaboratively. Such concerns are not to be raised publically either verbally, in writing, or in electronic forums. These matters are to be addressed through established program communication pathways.

Grade Scheme

Final Grade	Mark Equivalent	Numeric Value	Final Grade	Mark Equivalent	Numeric Value
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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

Please refer to the Course Section Information (CSI) / weekly schedule for specific course-related information as provided by your professor.

In order to pass the course, the student must have a grade of at least 50% (or “D-”) on both the theory component as well as in the applied (i.e. lab) component. This means that even if your combined grade exceeds 50% for the entire course, if you fail either the theory component or the applied component you will not achieve a passing grade in the course.

Department 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 Brightspace 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.

Department Grading Policy - For all courses that have both a theory and practical (lab) component, students must have a grade of at least 50% (or “D-”) on both the theory component as well as in the practical (i.e. lab) component in order to achieve a passing grade in the course. i.e. Even if your combined grade exceeds 50% for the entire course, if you fail either the theory component or the practical component, you will not achieve a passing grade in the course.

Lab/Practical Assessment Demonstration "Demo" Requirements - Certain courses require students to demo their work after it has been submitted. These will be scheduled by the professor and involve 1-2 rudimentary questions to assure the professor that the work submitted by the student is their own. Demos are not graded items - the work submitted is graded. However, where demos are required, if a student does not demo their work, the work will not be graded (i.e. grade of 0 on the lab or practical assessment).

Department Academic Dishonesty Policy - Academic Integrity is very important to all of our faculty and administrative staff and as such, measures have been put into place to detect all forms of academic dishonesty, including plagiarism of code. If plagiarism is detected by a professor, the incident will be reported and investigated. If the findings of the investigation are that a student has submitted plagiarized work as their own, they will be subject to the following policy:

1. The first offence will result in the plagiarized assessment being assigned a grade of 0.
2. The second offence will result in the assignment of a grade of F for the course.
3. The third offence will result in removal of a student from the program of study.

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

Algonquin College’s policies have been developed to ensure the health, safety and security of all students, faculty and staff, and the proper and fair operation of the College as an academic institution and employer. Please refer to the Algonquin College Policies website for the most current policy information available at <http://www.algonquincollege.com/policies/>.

Students are especially encouraged to be aware of the following College expectations

Academic Integrity

Algonquin College is committed to the highest standards of academic integrity, and students are expected to uphold these standards as part of the learning process. Any academic work submitted by a student is expected to be their own work, unless designated otherwise and all sources must be attributed. All students should be familiar with the Algonquin College policy [AA48: Academic Integrity](#), which outlines student’s roles and responsibilities and what represents academic dishonesty. In some courses, online proctoring may be used to prevent academic dishonesty. Additional information can be found at [Academic Integrity -](#)

[Student Survival Guide - Subject Guides at Algonquin College \(libguides.com\)](#) and via [Academic Integrity Student Resources](#). Students with any questions about the course expectations regarding academic integrity are encouraged to speak to their professor and the College's academic integrity team at acaio@algonquincollege.com

Centre for Accessible Learning

Students with visible and/or non-visible disabilities are encouraged to register with the [Centre for Accessible Learning \(CAL\)](#) in order to be eligible for appropriate learning supports and/or accommodations. Students are strongly encouraged to make an appointment with the Centre for Accessible Learning as early as possible when starting a program. Once your needs are identified, a Letter of Accommodation (LOA) will be issued which you can share with your professors. If you are a returning student, please ensure that professors are given a copy of your LOA each semester.

College Email

Students at Algonquin College are provided with a college email 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 activities. Your network credentials can be found in the [ACSIS portal](#) and you are expected to check your Algonquin email regularly and to use it to send and receive college-related email. Support is available through the college Information Technology Service (ITS) at: <https://www.algonquincollege.com/its/>

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 consult Algonquin College Policy [AA21: Deferred Evaluation](#).

Student Course Feedback

Algonquin College's invites students 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 Mobile Devices in Class

With the proliferation of small, personal mobile 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 unless authorized by your professor can be disruptive and disrespectful to others. During examinations, the use of such devices is generally prohibited unless authorized by your professor. Otherwise use is considered academic dishonesty in the form of cheating. For further details consult Algonquin College Policy [AA32: Use of Mobile Devices in Class](#)

Technology Requirements

Students are required to have access to a computer and to the internet. There may also be additional technology-related resources required to participate in a course that are not included in the course materials fee, such as headphones, webcams, specialized software, etc. Details on these requirements can be found in the Course Section Information of the course outline for each course available on Brightspace.

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.

Safe Harbour

In the event of an unexpected major event (pandemic, etc.), your course may have changes that are not reflected in the Course Outline. Should this happen, the Course Section Information document will have updated information about your course.