Algonquin College

# CST8215
# Introduction to Database
## Course Outline

2021-2022

| | |
|---|---|
| **Pre-requisite(s)** | N/A |
| **Co-requisite(s)** | N/A |
| **Prepared by** | Douglas King |
| **Approved by** | Sandra Brancatelli, Chair, ICT - Applications & Programming |
| **Normative hours** | 70.00 |
| **Grading system** | A+ Through F |
| **Experiential Learning** | No |

| Applicable Program(s) | Level | Core/Elective |
|---|---|---|
| 0006X01FWO - Computer Eng. Technology - Comp. Science | 1 | Core |
| 0006X03FWO - Computer Eng. Technology - Comp. Science | 1 | Core |
| 0336X01FWO - Computer Programming | 1 | Core |
| 0336X03FWO - Computer Programming | 1 | Core |
| 0336X07PAO - Computer Programming | 1 | Core |
| 0336X09FAO - Computer Programming | 1 | Core |

# Course Description

Students learn the fundamentals of Relational Databases design using Entity Relation diagrams, and use SQL to create, modify and query a database. Students design and create databases that are maintainable, secure and adaptable to change in business requirements, using Normalization. Students are able to compare and appreciate a Database Management System (DBMS) and its components with legacy systems.

# Vocational Learning Outcomes

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

## 0006X01FWO - Computer Eng. Technology - Comp. Science

**VLO 2**   Diagnose, troubleshoot, document and monitor technical problems using appropriate methodologies and tools. (T, A)

**VLO 3**   Analyze, design, implement and maintain secure computing environments. (T)

**VLO 4**   Analyze, develop and maintain robust computing system solutions through validation testing and industry best practices. (T, A)

**VLO 5**   Communicate and collaborate with team members and stakeholders to ensure effective working relationship. (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 responding to requirements and monitoring projects within a computing environment. (T, A)

**VLO 8**   Adhere to ethical, social media, legal, regulatory and economic requirements and/or principles in the development and management of the computing solutions and systems. (T, A)

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## 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)

**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 12**    Model, design, implement, and maintain basic data storage solutions (T, A)

**VLO 14**    Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship. (T)

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**VLO 1**    Identify, analyze, develop, implement, verify and document the requirements for a computing environment. (T, A)

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**VLO 12**    Model, design, implement, and maintain basic data storage solutions (T, A)

**VLO 14**    Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship. (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)

**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 12**    Model, design, implement, and maintain basic data storage solutions (T, A)

**VLO 14**    Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship. (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)

**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 12**    Model, design, implement, and maintain basic data storage solutions (T, A)

**VLO 14**    Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship. (T)

**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 3**    Execute mathematical operations accurately. (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 10**    Manage the use of time and other resources to complete projects. (T)

**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. Explain and use appropriate database terminology, apply knowledge of database concepts and knowledge of standard workplace documentation to support database design and implementation.**

- Identify structure of a Database System
- Explain relational database terminology
- Identify database types and describe database models
- Describe the types of IT jobs that rely on knowledge of databases
- Describe the purpose of the data dictionary
- Determine storage and use of metadata in a DBMS
- Explain database boolean logic operators
- Follow lab policies and procedures for etiquette, software licencing requirements and lab submissions
- Explain how transaction management is used to provide a database environment for high availability and performance
- Differentiate between materialized view and logical view. Determine their uses, advantages and disadvantages
- Build a scenario to demonstrate physical data independence and its use in database design. Use a database view to achieve Logical Data Independence.
- Draw a three tier architecture and place the database components in the appropriate tier. Compare a client server architecture to a terminal based system and a peer to peer system

**2. Use knowledge of database design theory, including normalization; draw logical and physical Entity Relationship (ER) Diagrams based on this theory.**

- Relate knowledge of design theory to provide solutions in response to business database software development proposals
- Use workplace tools to model database design using ER diagrams
- Explore basic Entity Relation Diagram (ERD) components - entities, attributes, relationships
- Define key, candidate key, prime key, foreign key, surrogate key and determinant.
- Communicate solutions electronically, in written and visual form
- Transform un-normalization data to Boyce-Codd Normal Form using principles of partial functional dependency, transitive dependency and functional dependency
- Differentiate between cardinality and degree of relationships
- Differentiate between identifying and non-identifying relationships

**3. Convert a logical database design into a relational schema; specify attribute types and constraints.**

- Map an ERD to a Relational Database
- Reverse engineer a database schema to reveal an ERD
- Create database backups
- Restore a database from a given backup

**4. Create a well-designed database and manipulate database objects using SQL commands.**

- Use Data Definition Language (DDL) to add, modify and delete database objects, i.e. tables, views, indexes
- Choose appropriate data types to create table
- Enforce entity integrity and referential integrity by choosing primary and foreign key constraints

**5. Write, debug and execute SQL statements to add, modify, retrieve and delete data.**

- Use Data Manupulation Language (DML) to insert, update, select and delete data
- Use basic SQL SELECT Statements to perform inner joins, outer joins and subqueries; including LEFT OUTER JOIN and RIGHT OUTER JOIN.
- Define a join operation, differential between a JOIN operation, CARTESIAN PRODUCT and a UNION
- Differentiate between scalar and vector aggregate functions
- Identify a correlated and non-correlated subquery
- Recognize personal limits and seek assistance in a timely manner to resolve problems
- Use SELF JOIN, observe the unary relationship in an ERD

**6. Create,organize and analyze information through the creation and manipulation of interrelated tables.**

- Create and manipulate database objects
- Create views and stored procedures and deploy them in a database.
- Differentiate between a stored procedure and a trigger

**7. Achieve an efficient database using physical design processes.**

- Justify controlled de-normalization

**8. As part of a team, explore sustainability, design and build a database to support decision making.**

- Research a topic on sustainability and build a database
- Build a successful team, respect diverse opinions, values, belief systems and contribution of team members
- Interact with team members to contribute to effective working relationship to achieve desired goal
- Plan individual and team projects, manage time to meet datelines
- Participate in team projects. Take responsibility for a fair contribution. Realize that marks earned will relate to a team members input through evaluation by teachers and peers

# Learning Resources

**Required:**

1. 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.
2. Introduction to Database Systems for College Students. Winter 2022 Edition. Publisher AC Press. Data files related to the course and workbook are available on One Drive.
3. Database Processing: Fundamentals, Design, and Implementation, 16e
   Kroenke, Auer, Vandenberg
   Pearson
   ISBN-13: 9780136930082

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. Specifications for the required laptop and additional information about the mobile program initiative can be found at the program's web page.

**Required Software:**

Students will install and use a relational database server such as Postgre SQL and a diagramming tool such as Model.io. These open software can be downloaded at no cost. Instructions for installation will be

# Learning Activities

This course consists of 2 in-class lectures (each 50 minutes), 1 hybrid activity (variable time) and 1 lab session (1 hour 50 minutes) 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.
**Hybrid:** Hybrid activities that focus, reinforce and expand the subject matter being discussed will be posted for learners to complete.
**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 tests and the final exam.

Course pacing will reflect the assumption that all in-class, hybrid and lab material is completed as indicated by the professor.

# Pre-defined Evaluation / Earning Credit

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

**Lab Activity(ies) (15%)**

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

**Quiz(zes)/Test(s) (15%)**

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

**Assignment(s) (20%)**

Validates Outcomes:  CLR 1, CLR 2, CLR 3, CLR 4, CLR 5, CLR 6, CLR 7, CLR 8, 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) (20%)**

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

**Final Exam (30%)**

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

# 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
- Project/Assignment

# 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 |
|---|---|---|---|---|---|
| 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.

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.  Even if your combined grade exceeds 50% for the entire course, if you do not achieve a minimum of D- in the theory component and the lab 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.

**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 .  In some courses, online proctoring may be used to discourage cheating. Additional information can be found at https://www.algonquincollege.com/studentsupportservices/student-learning-kit/preparing-to-learn-online/. Students with any questions about the course expectations for academic dishonesty and plagiarism are encouraged to speak to their professor.

### 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 at 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 can be  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 Mobile Devices in Class

### Technology Requirements

As Algonquin College continues to respond to public health guidelines, many courses will be offered through remote delivery. As such, students will be 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.