# CIS*3190 Software for Legacy Systems

## Winter 2019

Section: DE01

School of Computer Science

Credit Weight: 0.50

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# Course Details

## Calendar Description

This course is an introduction to legacy software systems used in business, manufacturing, and engineering. Topics include COBOL programming, mainframe systems, and integration of legacy systems with contemporary computing systems.

**Pre-Requisite(s):** CIS*2500 or work experience in a related field.

**Co-Requisite(s):** None

**Restriction(s):** None

**Method of Delivery:** Online

## Final Exam

There is no final exam in the course.

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# Instructional Support

## Instructor

**Michael A. Wirth**

**Email:** mwirth@uoguelph.ca

Dr. Wirth is an Associate Professor in the School of Computer Science. His interests lie in programming languages, problem solving, usability of everyday things, image processing, and computer science pedagogy.

### Teaching Assistant(s)

**Name:** Jingjing Wang
**Email:** jwang28@uoguelph.ca

**Name:** Adefunke Akinola
**Email:** adefunke@uoguelph.ca

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## Learning Resources

There is no course textbook.

### Course Website

CourseLink (powered by D2L's Brightspace) is the course website and will act as your classroom. It is recommended that you log in to your course website every day to check for announcements, access course materials, and review the weekly schedule and assignment requirements.

https://courselink.uoguelph.ca/shared/login/login.html

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## Learning Outcomes

### Course Learning Outcomes

The objective of this course is to explore three programming languages which symbolize legacy programming languages, and look at their context in modern software. Students will become familiarized with three legacy programming languages: Fortran, Ada, and Cobol. Fortran is still widely used to perform scientific calculations, Ada for real-time environments such as avionics, and Cobol in business.

By the end of this course, you should be able to:

1. Identify what legacy programs are, why they exist, and the difficulties that result from them;
2. Demonstrate a basic level of understanding and application related to legacy code in Fortran, Ada, and Cobol;
3. Analyze, translate and modernize, i.e., re-engineer, legacy code for Cobol and Fortran;

4. Be able to review a program written in a legacy language such as Fortran or Cobol, identify legacy and redundant features, and update the program in a newer dialect of the language; and
5. Understand the process of program re-engineering.

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# Teaching and Learning Activities

## Course Structure

- Unit 01: Introduction to legacy software: History, legacy systems today, applications.
- Unit 02: Introductory Fortran: Background and elementary language structures (e.g. data, operators, decision statements, I/O, math).
- Unit 03: Intermediate Fortran: Advanced programming structures (e.g. loops, arrays, subprograms).
- Unit 04: Modernizing Fortran: Converting programs in old dialects to newer versions of Fortran.
- Unit 05: Introductory Ada: Background and elementary language structures (e.g. data, operators, decision statements, loops, I/O, math).
- Unit 06: Intermediate Ada: Intermediate programming structures of Ada (e.g. strings, arrays, subprograms, packages).
- Unit 07: Advanced Ada: Advanced programming structures of Ada (e.g. exceptions, overloading, files, generics)
- Unit 08: Introductory Cobol: Background and elementary language structures (e.g. program structure, philosophy of Cobol, data, operators, I/O, math).
- Unit 09: Intermediate Cobol: Intermediate programming structures of Cobol (e.g. records, decision statements, loops).
- Unit 10: Modernizing Cobol: Converting programs in old dialects to newer versions of Cobol (e.g. redundant and legacy structures).
- Unit 11: Case Studies: The Millennium Bug (Y2K) and a look at various real legacy systems.
- Unit 12: Software Archaeology and Re-engineering Legacy Code

## Schedule

It is strongly recommended that you follow the course schedule provided below. The schedule outlines what you should be working on each week of the course and lists the important due dates for the assessments. By following the schedule, you will be better prepared to complete the assessments and succeed in this course.

## Unit 01: Introduction to legacy software

### Week 1 – Monday, January 7 to Sunday, January 13

#### Readings

- Website: Unit 01 Content

#### Activities

- Familiarize yourself with the course website by selecting **Start Here** on the navbar.
- Review **Outline** and **Assessments** on the course website to learn about course expectations, assessments, and due dates.
- Confirm your access to the course reserve materials by selecting **Ares** on the navbar.
- Complete Unit 01 activities:
    - Activity 1: Old Code
    - Activity 2: Old Languages

## Unit 02: Introductory Fortran

### Week 2 – Monday, January 14 to Sunday, January 20

#### Readings

- Website: Unit 02 Content

#### Activities

- Complete Unit 02 activities:
    - Activity 1: Radioactive Decay
    - Activity 2: Sun Kink
    - Activity 3: Wave Breaking
    - Activity 4: Is anything wrong?

## Unit 03: Intermediate Fortran

### Week 3 – Monday, January 21 to Sunday, January 27

#### Readings

- Website: Unit 03 Content

### Activities

- Complete Unit 03 activities:
    - Activity 1: Deflection in deck boards
    - Activity 2: Middle-square random numbers
    - Activity 3: MTBF

### Assessments

- Start **Assignment 1: Legacy Fortran**
  Due: Friday, February 1 by 11:59 pm ET

## Unit 04: Modernizing Fortran

**Week 4 – Monday, January 28 to Sunday, February 3**

### Readings

- Website: Unit 04 Content

### Activities

- Complete Unit 04 activities:
    - Activity 1: Roman Numerals
    - Activity 2: Day of Year

### Assessments

- Submit **Assignment 1: Legacy Fortran**
  Due: Friday, February 1 by 11:59 pm ET

## Unit 05: Introductory Ada

**Week 5 – Monday, February 4 to Sunday, February 10**

### Readings

- Website: Unit 05 Content

### Activities

- Complete Unit 06 activities:
    - Activity 1: C to Ada
    - Activity 2: Escape Velocity
    - Activity 3: Estimating Ice Thickness

## Unit 06: Intermediate Ada

### Week 6 – Monday, February 11 to Sunday, February 17

#### Readings

- Website: Unit 06 Content

#### Activities

- Complete Unit 07 activities:
    - Activity 1: UDF Engine Performance
    - Activity 2: Parcel Size
    - Activity 3: Luhn's Algorithm

#### Assessments

- Start **Assignment 2: Programming in Ada**
  Due: Friday, March 1 by 11:59 pm ET

***Winter Break: Monday, February 18 to Sunday, February 24***

## Unit 07: Advanced Ada

### Week 7 – Monday, February 25 to Sunday, March 3

#### Readings

- Website: Unit 07 Content

#### Activities

- Complete Unit 07 activities:
    - Activity 1: Typing Monkey
    - Activity 2: Soundex

#### Assessments

- Submit **Assignment 2: Programming in Ada**
  Due: Friday, March 1 by 11:59 pm ET

## Unit 08: Introductory Cobol

### Week 8 – Monday, March 4 to Sunday, March 10 *(40th Class Day: Friday, March 8)*

#### Readings

- Website: Unit 08 Content

### Activities

- Complete Unit 08 activities:
    - Activity 1: Investigating BSA
    - Activity 2: Student Loan Repayment

## Unit 09: Intermediate Cobol

### Week 9 – Monday, March 11 to Sunday, March 17

#### Readings

- Website: Unit 09 Content

#### Activities

- Complete Unit 09 activities:
    - Activity 1: Wind Chill Factor
    - Activity 2: Time Value of Money
    - Activity 3: Rule of 72

#### Assessments

- Start **Assignment 3: Cobol Re-engineering**
  Due: Friday, March 22 by 11:59 pm ET

## Unit 10: Modernizing Cobol

### Week 10 – Monday, March 18 to Sunday, March 24

#### Readings

- Website: Unit 10 Content

#### Activities

- Complete Unit 10 activities:
    - Activity 1: Soundex
    - Activity 2: Banking – EFT
    - Activity 3: Cobol Bubblesort

#### Assessments

- Submit **Assignment 3: Cobol Re-engineering**
  Due: Friday, March 22 by 11:59 pm ET

## Unit 11: Case Studies

### Week 11 – Monday, March 25 to Sunday, March 31

#### Readings

- Website: Unit 11 Content

#### Activities

- Complete Unit 11 activities:
    - Activity 1: Mortgage Amortization
    - Activity 2: Explore literature of legacy real-time systems
    - Activity 3: Analyze Y2K issues

#### Assessments

- Start **Assignment 4: Legacy Software**
  Due: Friday, April 5 by 11:59 pm ET

## Unit 12: Software Archaeology and Re-engineering Legacy Code

### Week 12 – Monday, April 1 to Friday, April 5

#### Readings

- Website: Unit 12 Content

#### Activities

- Complete Unit 12 activities:
    - Activity 1: Explore re-engineering legacy code
    - Activity 2: Compare C and Cobol programs
    - Activity 3: Review Colossal Cave code

#### Assessments

- Submit **Assignment #4**: Legacy Software
  Due: Friday, April 5 by 11:59 pm ET

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# Assessments

The grade determination for this course is indicated in the following table. A brief description of each assessment is provided below. Select **Content** on the navbar to locate **Assessments** in the table of contents panel to review further details of each assessment. Due dates can be found under the Schedule heading of this outline.

**Table 1: Course Assessments**

| Assessment Item | Weight |
|---|---|
| Assignment 1: Legacy Fortran | 25% |
| Assignment 2: Programming in ADA | 25% |
| Assignment 3: Cobol Re-engineering | 20% |
| Assignment 4: Legacy Software | 30% |
| **Total** | **100%** |

## Assessment Descriptions

### Assignment 1: Legacy Fortran

Re-engineering a legacy Fortran program to a new version of Fortran, and extending the program to achieve improved functionality.

### Assignment 2: Programming in ADA

Design and implement an Ada program to solve a particular problem.

### Assignment 3: Cobol Re-engineering

Migrate a legacy Cobol program into modern rendition of Cobol.

### Assignment 4: Legacy Software

A choice of one of four programming problems to do with language comparison, or legacy re-engineering.

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# Course Technologies and Technical Support

## CourseLink System Requirements

You are responsible for ensuring that your computer system meets the necessary system requirements. Use the browser check tool to ensure your browser settings are compatible and up to date. (Results will be displayed in a new browser window).

http://spaces.uoguelph.ca/ed/system-requirements/

https://courselink.uoguelph.ca/d2l/systemCheck

## Technical Skills

As part of your online experience, you are expected to use a variety of technology as part of your learning:

- Manage files and folders on your computer (e.g., save, name, copy, backup, rename, delete, and check properties);
- Install software, security, and virus protection;
- Use office applications (e.g., Word, PowerPoint, Excel, or similar) to create documents;
- Be comfortable uploading and downloading saved files;
- Communicate using email (e.g., create, receive, reply, print, send, download, and open attachments);
- Navigate the CourseLink learning environment and use the essential tools, such as **Dropbox**, **Quizzes**, **Discussions**, and **Grades** (the instructions for this are given in your course);
- Access, navigate, and search the Internet using a web browser (e.g., Firefox, Internet Explorer); and
- Perform online research using various search engines (e.g., Google) and library databases.

## Course Technologies

### CourseLink

Distance Education courses are offered entirely online using CourseLink (powered by D2L's Brightspace), the University of Guelph's online learning management system (LMS). By using this service, you agree to comply with the University of Guelph's Access and Privacy Guidelines. Please visit the D2L website to review the Brightspace privacy statement and Brightspace Learning Environment web accessibility standards.

http://www.uoguelph.ca/web/privacy/

https://www.d2l.com/legal/privacy/

https://www.d2l.com/accessibility/standards/

## Technical Support

If you need any assistance with the software tools or the CourseLink website, contact CourseLink Support.

**CourseLink Support**
University of Guelph
Day Hall, Room 211
Email: courselink@uoguelph.ca

Tel: 519-824-4120 ext. 56939
Toll-Free (CAN/USA): 1-866-275-1478

**Walk-In Hours (Eastern Time):**
Monday thru Friday: 8:30 am–4:30 pm

**Phone/Email Hours (Eastern Time):**
Monday thru Friday: 8:30 am–8:30 pm
Saturday: 10:00 am–4:00 pm
Sunday: 12:00 pm–6:00 pm

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# Course Specific Standard Statements

## Acceptable Use

The University of Guelph has an Acceptable Use Policy, which you are expected to adhere to.

https://www.uoguelph.ca/ccs/infosec/aup

## Communicating with Your Instructor

During the course, your instructor will interact with you on various course matters on the course website using the following ways of communication:

- **Announcements:** The instructor will use **Announcements** on the Course Home page to provide you with course reminders and updates. Please check this section frequently for course updates from your instructor.
- **Ask Your Instructor Discussion:** Use this discussion forum to ask questions of your instructor about content or course-related issues with which you are unfamiliar. If you encounter difficulties, the instructor is here to help you. Please post general course-related questions to the discussion forum so that all students have an opportunity to review the response. To access this discussion forum, select **Discussions** from the **Tools** dropdown menu.
- **Email:** If you have a conflict that prevents you from completing course requirements, or have a question concerning a personal matter, you can send your instructor a private message by email. The instructor will respond to your email within 48 to 72 hours.
- **Skype:** If you have a complex question you would like to discuss with your instructor, you may book a Skype meeting. Skype meetings depend on the availability of you and the instructor, and are booked on a first come first served basis.

## Netiquette Expectations

For distance education courses, the course website is considered the classroom and the same protections, expectations, guidelines, and regulations used in face-to-face settings apply, plus other policies and considerations that come into play specifically because these courses are online.

Inappropriate online behaviour will not be tolerated. Examples of inappropriate online behaviour include:

- Posting inflammatory messages about your instructor or fellow students;
- Using obscene or offensive language online;
- Copying or presenting someone else's work as your own;
- Adapting information from the Internet without using proper citations or references;
- Buying or selling term papers or assignments;
- Posting or selling course materials to course notes websites;
- Having someone else complete your quiz or completing a quiz for/with another student;
- Stating false claims about lost quiz answers or other assignment submissions;
- Threatening or harassing a student or instructor online;
- Discriminating against fellow students, instructors, and/or TAs;
- Using the course website to promote profit-driven products or services;
- Attempting to compromise the security or functionality of the learning management system; and
- Sharing your username and password.

## Submission of Assignments to Dropbox

All assignments for this course should be submitted electronically via the online **Dropbox** tool. You should hand in the **source code**, and **any relevant design documents** (preferable as a PDF document). When submitting your assignments using the **Dropbox** tool, do not leave the page until your assignment has successfully uploaded. To verify that your submission was complete, you can view the submission history immediately after the upload to see which files uploaded successfully. The system will also email you a receipt. Save this email receipt as proof of submission.

Be sure to keep a back-up copy of all of your assignments in the event that they are lost in transition. In order to avoid any last-minute computer problems, your instructor strongly recommend you save your assignments to a cloud-based file storage (e.g., Google Docs), or send to your email account, so that should something happen to your computer, the assignment could still be submitted on time or re-submitted.

It is your responsibility to submit your assignments on time as specified on the Schedule. Be sure to check the technical requirements and make sure you have the proper computer, that you have a supported browser, and that you have reliable Internet access. Remember that **technical difficulty is not an excuse not to turn in your assignment on time.** Don't wait until the last minute as you may get behind in your work.

If, for some reason, you have a technical difficulty when submitting your assignment electronically, please contact your instructor or CourseLink Support.

http://spaces.uoguelph.ca/ed/contact-us/

## Late Policy

If you choose to submit your individual assignments to the **Dropbox** tool late, the full allocated mark will be reduced by 10% per day after the deadline for the submission of the assignment to a limit of three days at which time access to the **Dropbox** folder will be closed.

Extensions will be considered for medical reasons or other extenuating circumstances. If you require an extension, discuss this with the instructor as soon as possible and well before the due date. Barring exceptional circumstances, extensions will not be granted once the due date has passed. These rules are not designed to be arbitrary, nor are they inflexible. They are designed to keep you organized, to ensure that all students have the same amount of time to work on assignments, and to help to return marked materials to you in the shortest possible time.

## Regrading Policy

Any questions regarding the grading of an assignment or test must be raised within 5 business days after the score or the graded assignment is made available. Assignments that do not compile will not be re-graded.

## Obtaining Grades and Feedback

Unofficial assessment marks will be available in the **Grades** tool of the course website.

Your instructor will have grades posted online within 2 weeks of the submission deadline, if the assignment was submitted on time. Once your assignments are marked you can view your grades on the course website by selecting **Grades** from the **Tools** dropdown menu on the navbar. Your course will remain open to you for seven days following the last day of the final exam period.

University of Guelph degree students can access their final grade by logging into WebAdvisor (using your U of G central ID). Open Learning program students should log in to the OpenEd Student Portal to view their final grade (using the same username and password you have been using for your courses).

https://webadvisor.uoguelph.ca

https://courses.opened.uoguelph.ca/portal/logon.do?method=load

## Rights and Responsibilities When Learning Online

For distance education (DE) courses, the course website is considered the classroom and the same protections, expectations, guidelines, and regulations used in face-to-face settings apply, plus other policies and considerations that come into play specifically because these courses are online.

For more information on your rights and responsibilities when learning in the online environment, visit Rights and Responsibilities.

http://opened.uoguelph.ca/student-resources/rights-and-responsibilities

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# University Standard Statements

## University of Guelph: Undergraduate Policies

As a student of the University of Guelph, it is important for you to understand your rights and responsibilities and the academic rules and regulations that you must abide by.

If you are a registered **University of Guelph Degree Student**, consult the Undergraduate Calendar for the rules, regulations, curricula, programs and fees for current and previous academic years.

If you are an **Open Learning Program Student**, consult the Open Learning Program Calendar for information about University of Guelph administrative policies, procedures and services.

https://www.uoguelph.ca/registrar/calendars/undergraduate/current/

http://opened.uoguelph.ca/student-resources/open-learning-program-calendar

## Email Communication

### University of Guelph Degree Students

As per university regulations, all students are required to check their uoguelph.ca e-mail account regularly: e-mail is the official route of communication between the University and its students.

### Open Learning Program Students

Check your email account (the account you provided upon registration) regularly for important communications, as this is the primary conduit by which the Open Learning and Educational Support will notify you of events, deadlines, announcements or any other official information.

## When You Cannot Meet Course Requirements

When you find yourself unable to meet an in-course requirement due to illness or compassionate reasons, please advise your course instructor **in writing**, with your name, ID number and email contact.

### University of Guelph Degree Students

Consult the Undergraduate Calendar for information on regulations and procedures for Academic Consideration.

https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

### Open Learning Program Students

Please refer to the Open Learning Program Calendar for information on regulations and procedures for requesting Academic Consideration.

http://opened.uoguelph.ca/student-resources/open-learning-program-calendar

## Drop Date

### University of Guelph Degree Students

The last date to drop one-semester courses, without academic penalty, is indicated on the Schedule section of this course outline. Review the Undergraduate Calendar for regulations and procedures for Dropping Courses.

https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

### Open Learning Program Students

Please refer to the Open Learning Program Calendar.

http://opened.uoguelph.ca/student-resources/open-learning-program-calendar

## Copies of Assignments

Keep paper and/or other reliable back-up copies of all assignments: you may be asked to resubmit work at any time.

## Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment.

### University of Guelph Degree Students

Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact Accessibility Services as soon as possible.

For more information, contact Accessibility Services at 519-824-4120 ext. 56208, email Accessibility Services or visit the Accessibility Services website.

accessibility@uoguelph.ca

https://wellness.uoguelph.ca/accessibility/

### Open Learning Program Students

If you are an Open Learning program student who requires academic accommodation, please contact the Academic Assistant to the Director. Please ensure that you contact us before the end of the first week of your course (every semester) in order to avoid any delays in support. Documentation from a health professional is required for all academic accommodations. Please note that all information provided will be held in confidence.

If you require textbooks produced in an alternate format (e.g., DAISY, Braille, large print or eText), please contact the Academic Assistant to the Director at least two months prior to the course start date. If contact is not made within the suggested time frame, support may be delayed. It is recommended that you refer to the course outline before beginning your course in order to determine the required readings.

The provision of academic accommodation is a shared responsibility between OpenEd and the student requesting accommodation. It is recognized that academic accommodations are intended to “level the playing field” for students with disabilities.

jessica.martin@uoguelph.ca

## Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar.

https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

## Copyright Notice

Content within this course is copyright protected. Third party copyrighted materials (such as book chapters and articles) have either been licensed for use in this course, or have been copied under an exception or limitation in Canadian Copyright law.

The fair dealing exemption in Canada's Copyright Act permits students to reproduce short excerpts from copyright-protected materials for purposes such as research, education, private study, criticism and review, with proper attribution. Any other copying, communicating, or distribution of any content provided in this course, except as permitted by law, may be an infringement of copyright if done without proper license or the consent of the copyright owner. Examples of infringing uses of copyrighted works would include uploading materials to a commercial third party web site, or making paper or electronic reproductions of all, or a substantial part, of works such as textbooks for commercial purposes.

Students who upload to CourseLink copyrighted materials such as book chapters, journal articles, or materials taken from the Internet, must ensure that they comply with Canadian Copyright law or with the terms of the University's electronic resource licenses.

For more information about students' rights and obligations with respect to copyrighted works, review Fair Dealing Guidance for Students.

http://www.lib.uoguelph.ca/sites/default/files/fair_dealing_policy_0.pdf

## Plagiarism Detection Software

Students should be aware that faculty have the right to use software to aid in the detection of plagiarism or copying and to examine students orally on submitted work. For students found guilty of academic misconduct, serious penalties, up to and including suspension or expulsion from the University can be imposed.

## Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.