

Computing Science (CSCI)

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Department website:

<http://www.smu.ca/academic/science/compsci/>

Students can obtain a Bachelor of Science in Computing Science in one of two possible ways. A traditional degree in Computing Science involving an emphasis in Mathematics is offered as a minor, concentration, major, or honours. Alternatively, students interested in applying the technical aspects of Computing Science to business can obtain a major in Computing Science and Business Administration. Both of these Computing Science options have a Co-op option.

The major and honours programs in computing science are accredited by the Computer Science Accreditation Council of the Canadian Information Processing Society (CIPS). Not only is this an assurance of program quality, but it also allows students to earn the Information Systems Professional (ISP) designation in less time.

Co-operative Education Program (Co-op)

This program is designed for students in the honours or major programs who wish to gain relevant work experience while attending university. The general requirements for the Co-operative Education program can be found in the Faculty of Science regulations, Co-operative Education Section, of this *Calendar*. Interested students should contact the Department of Mathematics and Computing Science Co-op advisor before the end of their first year.

Credit for Duplicate Courses

No student who has received credit for an advanced mathematics or computing science course may later receive credit for a mathematics or computing science prerequisite to the course without permission of the Department. With renumbered or restructured courses, students are advised that they are not eligible to take a course for credit if they already have a credit for a comparable course, even if that course was taken at a different level or under a different number.

Important Notes:

- CSCI 1226/CSCI 1227 or CSCI 1228 are intended to be the course(s) for all students who intend to pursue further studies in computing science.
- Students taking a concentration, major, or honours in computing science are permitted credit for at most one of MATH 1207, BIOL 2308, MGSC 2207, or PSYC 2350, and shall not be permitted credit for any of these courses simultaneously with or subsequent to MATH 1216.
- Related courses to a maximum of nine (9) credit hours offered by other Departments may be allowed for CSCI credit, with approval of the Department of Mathematics and Computing Science.
- Students pursuing a major or honours in Computing Science can also complete a minor in Mathematics by taking 30 credit hours in MATH, including MATH 2310, MATH 2311, MATH 2321 and three (3) additional credit hours in MATH, in addition to the MATH courses specified for the major or honours.
- MATH 2309, 4408 and 4409 can be used as a MATH course or CSCI course, but not both.

Major in Computing Science

For a major in Computing Science, students must complete the following 39 credit hours in Computing Science and 12 credit hours in Mathematics, in addition to the general requirements for the Bachelor of Science (see Section 3 for details on the requirements for B.Sc. with major):

- CSCI 1226 Introduction to Computing Science and Programming (see note below)
- CSCI 1227 Computer Programming and Problem Solving or CSCI 1228 Accelerated Programming and Problem Solving
- CSCI 2307 Theoretical Foundations of Computing Science
- CSCI 2327 Digital Logic and Computer Architecture
- CSCI 2328 Assembly Level Machine Organization and Language
- CSCI 2341 Data Structures and Algorithms I
- CSCI 2342 Data Structures and Algorithms II
- CSCI 3428 Software Engineering
- CSCI 3430 Principles of Programming Languages
- CSCI 3431 Operating Systems
- MATH 1210 Introductory Calculus I
- MATH 1211 Introductory Calculus II
- MATH 1216 Introduction to Mathematical Statistics
- MATH 2305 Survey of Discrete Mathematics
- MATH 2308 Introduction to Numerical Analysis
- MATH 2320 Linear Algebra I
- Three (3) credit hours in CSCI numbered 2306 or above
- Six (6) credit hours in CSCI numbered 3000 or above
- Three (3) credit hours in MATH numbered 2306 or above

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Note: Students passing the challenge test for CSCI 1228 may substitute three (3) additional credit hours in CSCI for CSCI 1226.

Suggested Program

The following program is recommended by the Department of Mathematics and Computing Science for students taking the Computing Science major program:

Year 1:

- ENGL 1205 Introduction to Literature
- CSCI 1226 Introduction to Computing Science
- CSCI 1227 Computer Programming and Problem Solving or CSCI 1228 Accelerated Programming and Problem Solving
- MATH 1210 Introductory Calculus I
- MATH 1211 Introductory Calculus II
- Six (6) credit hours in Science (not CSCI)
- Three (3) credit hours in Humanities
- Six (6) credit hours from Arts or Economics

Year 2:

- CSCI 2307 Theoretical Foundations of Computing Science
- CSCI 2327 Digital Logic and Computer Architecture
- CSCI 2328 Assembly Level Machine Organization and Language
- CSCI 2341 Data Structures and Algorithms I
- CSCI 2342 Data Structures and Algorithms II
- MATH 2305 Survey of Discrete Mathematics
- MATH 2308 Introduction to Numerical Analysis
- Six (6) credit hours in Science (not CSCI)
- Three (3) credit hours in Arts or Economics

Year 3:

- CSCI 3428 Software Engineering
- CSCI 3430 Principles of Programming Languages
- CSCI 3431 Operating Systems
- MATH 1216 Introduction to Mathematical Statistics
- MATH 2320 Linear Algebra I
- Six (6) credit hours in Science (not CSCI)
- Nine (9) credit hours of electives

Year 4:

- Three (3) credit hours in CSCI numbered 2306 or above
- Six (6) credit hours in CSCI numbered 3000 or above
- Three (3) credit hours in MATH numbered 2306 or above
- Three (3) credit hours in Arts or Economics
- Fifteen (15) credit hours of electives

Double Major in Computing Science and Mathematics

For a double major in Computing Science and Mathematics, students must complete the following 39 credit hours in Computing Science, 33 credit hours in Mathematics and 6 credit hours in either Mathematics or Computing Science, in addition to the general requirements for the Bachelor of Science (see Section 3 for details on the requirements for BSc with major):

1. CSCI 1226 Introduction to Computing Science and Programming (see note below)
2. CSCI 1227 Computer Programming and Problem Solving or CSCI 1228 Accelerated Programming and Problem Solving
3. CSCI 2307 Theoretical Foundations of Computing Science
4. CSCI 2327 Digital Logic and Computer Architecture
5. CSCI 2328 Assembly Level Machine Organization and language
6. CSCI 2341 Data Structures and Algorithms I
7. CSCI 2342 Data Structures and Algorithms II
8. CSCI 3428 Software Engineering
9. CSCI 3430 Principles of Programming Languages
10. CSCI 3431 Operating Systems
11. MATH 1210 Introductory Calculus I
12. MATH 1211 Introductory Calculus II
13. MATH 1216 Introduction to Mathematical Statistics
14. MATH 2305 Survey of Discrete Mathematics
15. MATH 2308 Introduction to Numerical Analysis
16. MATH 2310 Intermediate Calculus I
17. MATH 2311 Intermediate Calculus II
18. MATH 2320 Linear Algebra I
19. MATH 2321 Linear Algebra II
20. Six (6) credit hours in MATH numbered 3000 or above
21. Three (3) credit hours in CSCI numbered 2306 or above
22. Six (6) credit hours in CSCI numbered 3000 or above
23. Six (6) credit hours in MATH or CSCI numbered 2306 or above

Note: Students passing the challenge test for CSCI 1228 may substitute three (3) additional credit hours in CSCI for CSCI 1226.

Double Major in Computing Science and another Science

For a double major in Computing Science and another Science other than Mathematics, students must fulfill all of the specified required courses in CSCI and MATH for the major (requirements 1 – 16) above, plus an additional three (3) credit hours in CSCI numbered 2306 and above and an additional three (3) credit hours in MATH numbered 2306 and above.

Honours in Computing Science

Students with a cumulative GPA of 3.00 or above are encouraged to apply for admission to the honours program. For honours in Computing Science, students must fulfill the major requirements plus

1. CSCI 3451 Theory of Computation
2. Nine (9) additional credit hours in CSCI numbered 2306 or above
3. Six (6) additional credit hours in CSCI numbered 3000 or above
4. Six (6) additional credit hours in MATH numbered 3000 or above. It is recommended that CSCI 4500 Research Thesis be used to satisfy this requirement.

resulting in a total of 57 credit hours in CSCI and 27 credit hours in MATH

Students must achieve a Degree GPA of 3.00 or above on those courses presented in fulfillment of the Bachelor of Science with Honours in Computing Science requirements.

Double Honours in Computing Science and Mathematics

For double honours in Computing Science and Mathematics, students must fulfill all of the specified required courses in CSCI and MATH for the double major (requirements 1 – 19), plus:

1. CSCI 3451 Theory of Computation
2. MATH 4420 Abstract Algebra I
3. MATH 4441 Real Analysis I
4. Three (3) additional credit hours in CSCI numbered 2306 or above
5. Six (6) additional credit hours in CSCI numbered 3000 or above. CSCI 4500 Research Thesis can be used to satisfy this requirement.
6. Six (6) additional credit hours in MATH numbered 3000 or above resulting in a total of 51 credit hours in CSCI and 45 credit hours in MATH. MATH 4500 Research Thesis can be used to satisfy this requirement.
7. Six (6) additional credit hours in MATH numbered 3000 or above

resulting in a total of 51 credit hours in CSCI and 45 credit hours in MATH

Students must achieve a Degree GPA of 3.00 or above on those courses presented in fulfillment of the Bachelor of Science with Honours in Computing Science requirements.

Double Honours in Computing Science and another Science

For double honours in Computing Science and Mathematics, students must fulfill all of the specified required courses in CSCI and MATH for honours, plus:

- Three (3) additional credit hours in MATH courses numbered 2306 or above.
- Six (6) additional credit hours in CSCI courses numbered 2306 or above.

Concentration in Computing Science

Students may complete a 3 year (90 credit hour) Bachelor of Science with a concentration in computing science. See Section 3 for details on the requirements for general B.Sc. with concentration. The Computing Science concentration requires 36 credit hours in Computing Science and Mathematics as follows:

1. CSCI 1226 Introduction to Computing Science and Programming (see note below)
2. CSCI 1227 Computer Programming and Problem Solving or CSCI 1228 Accelerated Programming and Problem Solving
3. CSCI 2327 Digital Logic and Computer Architecture

4. CSCI 2328 Assembly Level Machine Organization and language
5. CSCI 2341 Data Structures and Algorithms I
6. CSCI 2342 Data Structures and Algorithms II
7. Twelve (12) credit hours in CSCI numbered 2306 or above
8. MATH 1210 Introductory Calculus I
9. MATH 1211 Introductory Calculus II

Note: Students passing the challenge test for CSCI 1228 may substitute three (3) additional credit hours in CSCI for CSCI 1226.

Requirements for a Minor in Computing Science

It is possible to obtain a minor in Computing Science by completing 30 credit hours in Computing Science as follows:

1. CSCI 1226 Introduction to Computing Science and Programming (see note below)
2. CSCI 1227 Computer Programming and Problem Solving or CSCI 1228 Accelerated Programming and Problem Solving
3. CSCI 2327 Digital Logic and Computer Architecture
4. CSCI 2328 Assembly Level Machine Organization and language
5. CSCI 2341 Data Structures and Algorithms I
6. CSCI 2342 Data Structures and Algorithms II
7. Twelve (12) credit hours in CSCI numbered 2306 or above

Note: Students passing the challenge test for CSCI 1228 may substitute three (3) additional credit hours in CSCI for CSCI 1226.

Major in Computing Science and Business Administration

This is an interdisciplinary four year degree combining Computing Science courses, taught in the Department of Mathematics and Computing Science, with a selection of courses taught in the Sobey School of Business. This program is designed to meet the increasing demand for people with a solid technical knowledge of Computing Science who also understand the application of this technology to business problems.

To declare this program as a major, students should consult with the Co-ordinator of Computing Science in the Department of Mathematics and Computing Science. Due to restrictions associated with the prerequisite structure, students are strongly suggested to take courses in the sequence shown below.

Year 1:

- ENGL 1205 Introduction to Literature
- CSCI 1226 Introduction to Computing Science
- CSCI 1227 Computer Programming and Problem Solving or CSCI 1228 Accelerated Programming and Problem Solving
- MATH 1210 Introductory Calculus I
- MATH 1216 Introduction to Mathematical Statistics
- MGMT 1281 Introduction to Business Management
- ECON 1201 Principles of Economics: Micro
- ECON 1202 Principles of Economics: Macro
- Six (6) credit hours in Science (not CSCI)

Year 2:

- CSCI 2327 Digital Logic and Computer Architecture
- CSCI 2355 Internet Technologies and Web Programming
- CSCI 2341 Data Structures and Algorithms I
- Cisy 2320 Business Applications Programming
- ACCT 2241 Introductory Financial Accounting
- ACCT 2242 Introductory Managerial Accounting
- MKTG 2270 Introduction to Marketing
- MGMT 2383 Micro Organizational Behaviour
- MGMT 2384 Macro Organizational Behaviour
- Three (3) credit hours of electives

Year 3:

- Six (6) credit hours in CSCI numbered 2306 or above
- MATH 2320 Linear Algebra I
- ACCT 3332 Planning and Control
- FINA 2360 Business Finance I
- FINA 3361 Business Finance II
- Nine (9) credit hours in Science (not CSCI)
- Three (3) credit hours in Humanities

Year 4:

- Twelve (12) credit hours in CSCI numbered 3000 or above
- MGMT 4489 Strategic Management
- ACCT 3323 Management Information Systems
- Cisy 4425 Systems Analysis and Design
- Six (6) credit hours in Arts
- Three (3) credit hours of electives

Notes:

- Students passing the challenge test for CSCI 1228 may substitute three (3) additional credit hours in CSCI for CSCI 1226.
- For students in this program, MATH 1210 can replace MGSC 1205 or MGSC 1206 as a prerequisite for other business courses.
- For students in this program, CSCI 1228 can replace Cisy 1225 as a prerequisite for other business courses. However, a knowledge of the topics covered in Cisy 1225 will be assumed in other courses.
- Students may not receive credit for Cisy 1225 if taken concurrently with or subsequent to CSCI 1226 or CSCI 1228.
- Cisy 2320 will be acceptable as a CSCI elective above 2306 and below 3000 level.
- Cisy 3327 will be acceptable in lieu of CSCI 2355. Students cannot receive credits for both Cisy 3327 and CSCI 2355.
- Cisy 4425 will be acceptable in lieu of CSCI 3428. Students cannot receive credit for both Cisy 4425 and CSCI 3428
- Cisy 3326 will be acceptable in lieu of CSCI 3461. Students cannot receive credits for both Cisy 3326 and CSCI 3461.
- Cisy 4436 will be acceptable in lieu of CSCI 3421. Students cannot receive credits for both Cisy 4436 and CSCI 3421.

Course Descriptions

1226 Introduction to Computing Science and Programming

3 credit hours

Prerequisite: There is no formal prerequisite for this course; however, some prior experience with analytical thinking is highly recommended.

This course is designed to introduce the student to some of the key concepts in computing science and simultaneously provide introductory hands-on experience using a modern programming language. General topics will include a brief history of computing; the place of hardware, software, and policies in any computing environment; a high-level view of the components of a computing system; and the tools one can expect to find in any programming environment. Programming language topics will include input/output; simple data types; operators and expressions; looping and decision-making control constructs; subprograms and parameter passing; overall program structure and programming style considerations. Problem-solving and program-design strategies will include divide-and-conquer and top-down design with step-wise refinement. Students will design algorithms with data input and output to solve particular problems, and later implement those solutions as computer programs in the current programming language of choice.

Classes 3 hrs. and lab 3 hrs. a week.

1227 Computer Programming and Problem Solving

3 credit hours

Prerequisite: CSCI 1226.

This course is designed to extend the student's knowledge of, and provide additional hands-on experience with, the programming language encountered in CSCI 1226, in the context of the structured data types provided by that language, and within the larger contexts of object-oriented programming and more complex problem-solving situations. Techniques for managing file input and output in the current language will also be studied. A number of classical algorithms and data structures for the storage and manipulation of information of various kinds in a computer's internal memory will be studied. The student will acquire the knowledge that comes from actually implementing a non-trivial abstract data type and the experience that comes from having to make use, as a client program, of an abstract type that has already been implemented.

Classes 3 hrs. and lab 3 hrs. a week.

1228 Accelerated Programming and Problem Solving
3 credit hours

This course is intended for students who have programming experience from high school, and who have achieved the required grade on a challenge test administered at the beginning of the term. It begins with a quick review of the topics normally treated in CSCI 1226 followed by enhanced coverage of the current material from CSCI 1227.

Classes 3 hrs. and lab 3 hrs. a week.

Note: Students who receive credit for CSCI 1228 will not receive credit for CSCI 1227.

2301 Data Structures and Numerical Methods for Engineers

3 credit hours

Prerequisites: CSCI 1226 or EGNE 1204

This class introduces students to system analysis and software techniques. Topics covered include data structures such as stacks, queues, multiple linked lists, searching and sorting algorithms, and their implementation in an object-oriented programming language. Students use linear algebra and numerical methods in engineering examples, while learning to implement properly structured solutions.

Note: This course is intended only for Engineering students. Computing Science students (CPSC or CSCI) should take CSCI 2341 and CSCI 2342 instead. No credit will be given for this course simultaneously with or subsequent to CSCI 2341.

Classes 3 hrs. and recitation 1 1/2 hrs. a week.

2307 Theoretical Foundations of Computing Science

3 credit hours

Prerequisites: CSCI 1227 or CSCI 1228, and MATH 2305

This course complements CSCI 2341. It uses various mathematical concepts to define tools and address problems of fundamental status in Computing Science. Topics will involve notions related to graphs, formal languages and computability. Moreover, depending on the focus, other fundamental tools will be considered, which are utilized in topics such as database modeling, information coding, complexity, knowledge modeling, program correctness and automated reasoning.

2327 Digital Logic and Computer Architecture

3 credit hours

Prerequisite: CSCI 1227 or CSCI 1228.

This course considers data representation, digital logic and computer organization at the assembly language level. The student will be introduced to the concept of computation at the digital logic level by studying devices for storing data, transferring data, and making decisions based on data patterns (e.g. flip-flops, registers, tri-states, bus structures, multiplexers, comparators, and adders). Computer organization includes the fetch—execute cycle of a processor, addressing modes of the machine, the data

path, the memory hierarchy, and the input/output subsystem.

Classes 3 hrs. and recitation 1 1/2 hrs. a week.

2328 Assembly Level Machine Organization and Language

3 credit hours

Prerequisite: CSCI 2327

This course builds on the experience obtained in CSCI 2327 by examining some topics in more detail and applying them to a particular processor. The students will also learn assembly language programming for the processor.

Classes 3 hrs. and recitation 1 1/2 hrs. a week.

2341 Data Structures and Algorithms I

3 credit hours

Prerequisite: CSCI 1227 or CSCI 1228.

This course provides an introduction to some of the fundamental theoretical concepts in computing science. These theoretical concepts will be applied to some programming problems. The course will introduce the basis for evaluating algorithms. This basis will be used to analyze various searching and sorting algorithms. Students will be introduced to the concept of lower-bound time requirements for specific problems. Examples of various problem solving strategies such as greedy algorithms, divide-and-conquer, and backtracking will be discussed.

Classes 3 hrs. and recitation 1 1/2 hrs. a week.

2342 Data Structures and Algorithms II

3 credit hours

Prerequisite: CSCI 2341.

This course provides an introduction to data structures and associated algorithms. Students will build on the theoretical and programming skills developed in CSCI 1226/1227/1228 and CSCI 2341 through a systematic study of some of the fundamental computing science concepts. The course will use the basis for evaluating algorithms, established in CSCI 2341, to study various data structures and related operations. The data structures that will be studied in this course include lists, stacks, queues, hash tables, binary trees, and binary search trees. The operations on these data structures include creation, destruction, insertions, deletions, searching, and sorting. Contiguous and linked designs and corresponding implementations of these data structures will be studied. Students will be expected to create some of the data structures. The advantages and disadvantages of using these data structures will be studied.

Classes 3 hrs. and recitation 1 1/2 hrs. a week.

2355 Internet Technologies and Web Programming

3 credit hours

Prerequisite: CSCI 1227 or CSCI 1228.

This course will discuss a number of fundamental architectures, protocols and scripting languages for displaying and transferring data of various kinds in the

context of the Internet and the World Wide Web. Students will gain experience with web programming concepts and techniques.

Classes 3 hrs. and recitation 1 1/2 hrs. a week.

3421 Data Communications and Networking

3 credit hours

3428 Software Engineering

3 credit hours

Prerequisite: CSCI 2342.

In this course, students will obtain experience in the development of large scale software systems. The software life-cycle will be studied in detail. Issues of software documentation, reliability, and maintenance will be discussed. Several strategies for specification (formal and informal), design (functional, top-down, object-oriented, etc.), implementation, and verification and validation will be considered. The course will involve a major project that will expose students to the stages of the software life-cycle. Students should expect to work in teams.

3430 Principles of Programming Languages

3 credit hours

Prerequisite: CSCI 2342 and MATH 2305.

This course is designed to introduce the student to some of the key concepts underlying all programming languages by comparing and contrasting major programming language paradigms such as procedural, functional, logic, object-oriented, and parallel. Topics may include history and evolution of programming languages; programming language design goals, the place of programming languages in the programming environment; virtual machines; data representation, manipulation and sharing; type checking; storage management; control structures; language mechanisms that support modularity; syntax and semantics. The laboratory component will provide hands-on experience with several different languages from different paradigms.

Classes 3 hrs. and recitation 1 1/2 hrs. a week.

3431 Operating Systems

3 credit hours

Prerequisite: CSCI 2328.

Students will study various aspects of operating systems with emphasis on the following topics: history, evolution, and philosophies; tasking and processes; process coordination and synchronization; scheduling and dispatch; physical and virtual memory organization; device management; file systems and naming; security and protection; communications and networking; distributed operating systems; and real-time concerns. Examples of two or more operating systems will be used to gain some systems programming experience.

Classes 3 hrs. and recitation 1 1/2 hrs. a week.

3451 Theory of Computation

3 credit hours

Prerequisite: CSCI 2342 and CSCI 2307.

This course provides an introduction to some of the fundamental theoretical concepts in computing science. Students will be introduced to the concepts of decidable, P, NP, NP-complete, and NP-hard problems. Two classes of languages of interest to computing scientists, namely, regular and context free languages, and corresponding automata for recognizing these languages, will also be studied. A brief discussion on the semantics of programming languages will be included. The concept of automata will be further extended using Turing machines. Turing machines will be used to explore the concept of decidability along with examples of decidable and undecidable problems.

3461 Database Systems

3 credit hours

Prerequisite: CSCI 2342 and MATH 2305.

This course provides an introduction to the design, implementation, use and maintenance of databases. Topics will include: data models such as the entity-relationship model, the relational model, and the object-oriented model; relational languages such as relational algebra, relational calculus, and SQL; the theory of normal forms of database design; use of indexes for efficient data retrieval; and database implementation using a commercial database management system. Other topics may be included, such as query optimization, database control, and distributed database systems.

3462 File Structures

3 credit hours

Prerequisite: CSCI 2342 and MATH 2305.

This course provides the student with the tools and techniques required to organize and efficiently maintain data on a secondary storage devices. The course will consider the implementation and performance of structures such as fields, records and buffers; primary and secondary indexes; multi-level indexes and B-trees; indexed sequential files; and hash structures. Also included will be some discussion of advanced sort and merge algorithms for secondary storage.

3465 Object-Oriented Programming

3 credit hours

Prerequisite: CSCI 2342 and MATH 2305.

This course provides an introduction to object-oriented analysis, design, and programming. Emphasis will be on the creation of reusable software. The object-oriented approach to software development will be compared and contrasted with other approaches, such as the classical "structured" approach. Students will gain hands-on experience by programming in a suitable object-oriented programming language.

Classes 3 hrs. and recitation 1 1/2 hrs. a week.

3475 Human Computer Interaction

3 credit hours

Prerequisite: CSCI 1227 or CSCI 1228 or Cisy 2320, or permission of the instructor.

The objective of this course is to teach future software developers, designers and managers to avoid pitfalls of wasting time and energy building software that no one will be able to use. This is accomplished by leading the students through a design process, from identifying and learning about the users/clients to creating and finally evaluating prototypes. We will consider both classic and cutting-edge interaction technologies as they relate to human factors. This is a project-based.

Classes 3 hrs. and recitation 1 1/2 hrs. a week.

3482 Artificial Intelligence

3 credit hours

Prerequisite: CSCI 2342, MATH 1216, and MATH 2305.

This course provides a general introduction to artificial intelligence (AI). The course will consider philosophical, mathematical, experimental, and implementation aspects of such topics as problem solving, searching, game playing, genetic algorithms, learning, neural networks, natural language processing, vision, knowledge representation, logic, expert systems, reasoning under uncertainty, fuzzy sets, planning, and robotics. In addition to a theoretical introduction, students will also gain experience using one or more of the popular AI tools.

3826 – 3849 Special Topics in Computing Science

3 credit hours

Prerequisite: permission of instructor.

Approved seminar courses dealing with specialized subject-matter that are announced from time to time by the Department.

4423 Cryptography

3 credit hours

Prerequisite: CSCI 2342, MATH 2305, and MATH 2320.

This course provides an introduction to various aspects of data security. Possible topics: classical encryption methods such as Vignere and Vernan ciphers; the Data Encryption Standard; key distribution methods and public key encryption; and authentication using digital signatures. Applications of these methods in the design of protocols for data privacy and security will also be studied.

4452 Algorithm Analysis

3 credit hours

Prerequisite: CSCI 2342 and MATH 2305.

This course will build on the concepts of algorithm analysis introduced in CSCI 2341. Some of the key techniques of efficient algorithm design that will be discussed: divide and conquer; greedy methods; dynamic programming; graph traversal; and change of representation. Measuring algorithm performance and lower bounds for various problems will be studied. An introduction to complexity theory-P, NP, polynomial time reducibility, and NP-completeness- will also be provided

4463 Numerical Software

3 credit hours

Prerequisite: CSCI 2342 and MATH 2308

This course will study software development issues in the area of numerical analysis. The course will examine a number of numerical software tools such as Fortran90, Matlab, and Maple. The main course project will be the development of a numerical software package by students working in programming teams in a selected area of numerical algorithms.

Classes 3 hrs. and recitation 1 1/2 hrs a week.

4471 Computer Graphics

3 credit hours

Prerequisite: MATH 2310 and 2320; and CSCI 2342.

This course provides an overview of the principles and methodologies of computer graphics, including the representation, manipulation, and display of two- and three-dimensional objects. Subtopics may include characteristics of display devices (i.e., raster, vector); representing primitive objects (lines, curves, and surfaces) and composite objects; two- and three-dimensional transformations (translation, rotation, scaling); hidden lines and surfaces; shading and colouring; interactive graphics and the user interface; animation techniques.

Classes 3 hrs. and recitations 1 1/2 hrs. a week.

4474 Information Retrieval

3 credit hours

Prerequisite: CSCI 2342

This course considers manipulations on a bibliographic database. Topics to be covered include an introduction and basic definitions, inverted file structures, automatic indexing, prototype systems, retrieval and refinements and natural language processing.

4476 Computer Vision and Digital Image Processing

3 credit hours

Prerequisite: CSCI 2342.

This course provides an introduction to the concepts used in computer vision and digital image processing. Computer vision techniques extract information from an image, while image processing techniques modifies the image for viewing by the human eye. Topics covered include the following: sampling and resolution, image processing, edge detection, segmentation, discrete image transforms, restoration and enhancement, and image compression.

4477 Data Mining

3 credit hours

Prerequisite: CSCI 2342.

Data mining refers to a family of techniques used to detect interesting knowledge in data. With the availability of large databases to store, manage and assimilate data, the new thrust of data mining lies at the intersection of database systems, artificial intelligence and algorithms that efficiently analyze data. The course will use concepts from

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pattern recognitions, statistics, data analysis and machine learning. The size of databases and high complexity of techniques present many interesting computational challenges.

4500 Research Thesis

6 credit hours

Prerequisite: honours standing and permission of the thesis committee.

Research project in computing science carried out by the student under the supervision of any member of the Department. The student will submit a thesis and present it orally.

4826 - 4849 Special Topics in Computing Science

3 credit hours

Prerequisite: permission of instructor.

This course covers advanced topics in computing science chosen according to the interests of the students and instructor, and requires some measure of independence and initiative from the student.

Seminar 3 hrs. a week.

Criminology (CRIM)

Chairperson, Professor	E. Tastsoglou
Professors	G. Barrett, L. Christiansen-Ruffman, J. McMullan, H. Veltmeyer
Associate Professors	S. Bell, M. Byers, D. Crocker, V. Johnson, D. Perrier, S. Schneider, A. Schulte-Bockholt, M. VanderPlaat, R. Westhaver
Assistant Professors	K. Bonnycastle, M. Ighodaro, A. MacNevin, M. Rajiva, D. Stefanovic
Coordinator of Criminology: Graduate Studies	D. Crocker
Adjunct Professors	B. Cottrell, S. Perrott

Department website:

<http://www.smu.ca/academic/arts/sociology/>

Department Mission

The Department of Sociology and Criminology offers programs of study that are designed to provide students with a strong undergraduate experience in both sociology and Criminology. Majors and honours programs are offered in each field. Students are particularly encouraged to complete a double major program in sociology and Criminology. The Department also offers a Master's degree. Courses are also mounted that support such other academic programs as those in Asian Studies, Atlantic Canada Studies, International Development Studies, Linguistics, and Women and Gender Studies. For details on graduate programs, refer to the Graduate Academic Calendar.

The purpose of a Bachelor of Arts degree in Criminology, including the honours program, is to provide students with an opportunity for focused critical study of various forms of regulation, policing, punishment, justice, law, delinquency and misbehaviour. The development of a coherent program at the undergraduate level enables students to obtain a solid foundation in Criminology for further study at the graduate level; for the pursuit of Criminology-related disciplines; and for careers in the related professions. A structured honours program is included for outstanding undergraduate students.

Major Program

For admission to the program, students must have completed SOCI 1210 and 1211 with a minimum grade of C in each course; and six (6) additional credit hours with a minimum grade of C in each course from the following courses: ANTH 1202, ANTH 1280, ECON 1201, ECON 1202, POLI 1201, POLI 1210, POLI 1220, POLI 1230, POLI 1240, POLI 1250, PSYC 1200, PSYC 1250, or PSYC 1260.

To major in Criminology, students must complete forty-two (42) credit hours as follows:

- Criminology Core**
CRIM 2300 Classical Criminological Theory
CRIM 2301 Contemporary Criminological Theory
CRIM 2302 Criminal Statistics
CRIM 2303 Crime and Society
CRIM 2304 Canadian Criminal Justice System
CRIM 2364/SOCI 2364 Research Methods
- Twelve (12) credit hours in CRIM at the 3000 level
- Six (6) credit hours in CRIM at the 4000 level or PSYC 3320; PSYC 3335; PHIL 2332 and PHIL 2333.
- six (6) credit hours at the 3000 or 4000 level not listed as above in one of the following social sciences: Anthropology, Economics, Geography, Political Science, Psychology and Sociology.

Because of the significant interest in Criminology, the number of qualified students permitted to declare Criminology as their major or subject of honours may have to be limited.

FOR STUDENTS COMPLETING A DOUBLE MAJOR IN SOCIOLOGY AND CRIMINOLOGY, ONLY TWELVE (12) CREDIT HOURS CAN BE DOUBLE COUNTED FOR CROSS-LISTED COURSES.