COMPUTING AND INFORMATION SCIENCE (CIS)

CIS*1050 Web Design and Development Winter and Summer [0.50]
An introduction to the basics of designing and developing a website. It examines the basic concepts, technologies, issues and techniques required to develop and maintain websites. The course is suitable for students with no previous programming experience.
Offering(s): Offered through Distance Education format only.
Department(s): School of Computer Science
Location(s): Guelph

CIS*1200 Introduction to Computing Fall and Winter (LEC: 3, LAB: 2) [0.50]
This course covers an introduction to computer hardware and software, data organization, problem-solving and programming. The course includes exposure to application packages for personal and business use and is intended forstudents who wish a balance between programming and the use of software packages.
Offering(s): Offered through Distance Education format only.
Restriction(s): CIS*1000. Not available to students registered in a BCOMP degree or a CIS minor.
Department(s): School of Computer Science
Location(s): Guelph

CIS*1250 Software Design I Fall Only (LEC: 3, LAB: 2) [0.50]
This is an introductory course which involves a general overview of design and problem solving as it is practiced in different disciplines. The course will include an examination of the qualities of software as the end product of the design process. It will include a study of the pervasiveness of software, and the platform specific considerations. The course has an applied focus and will involve software design and development experiences in teams, a literacy component, and the use of software development tools.
Restriction(s): Restricted to students in BCOMP.SENG and BCOMP.SENG:C
Department(s): School of Computer Science
Location(s): Guelph

CIS*1300 Programming Fall Only (LEC: 3, LAB: 2) [0.50]
This course examines the applied and conceptual aspects of programming. Topics may include data and control structures, program design, problem solving and algorithm design, operating systems concepts, and fundamental programming skills. This course is intended for students who plan to take later CIS courses. If your degree does not require further CIS courses consider CIS*1500 Introduction to Programming.
Restriction(s): CIS*1500. This is a Priority Access Course. Enrolment may be restricted to particular programs or specializations. See department for more information.
Department(s): School of Computer Science
Location(s): Guelph

CIS*1500 Introduction to Programming Fall and Winter (LEC: 3, LAB: 1) [0.50]
This course introduces problem-solving, programming and data organization techniques required for applications using a general purpose programming language. Topics include control structures, data representation and manipulation, program logic, development and testing. This course is intended for students who do not intend to enroll in further CIS courses. If your degree requires further CIS courses, CIS*1300, is required.
Restriction(s): CIS*1300. Not available to students registered in a BCOMP degree, a CIS minor, BENG.CENG or BENG.ESC.
Department(s): School of Computer Science
Location(s): Guelph

CIS*1910 Discrete Structures in Computing I Fall Only (LEC: 3, LAB: 2) [0.50]
This course is an introduction to discrete structures and formal methodologies used in computer science, including Boolean algebra, propositional logic, predicate logic, proof techniques, set theory, equivalence relations, order relations, and functions.
Department(s): School of Computer Science
Location(s): Guelph

CIS*2030 Structure and Application of Microcomputers Fall Only (LEC: 3, LAB: 3) [0.50]
This course examines the components of a computer system, including memories, CPU, buses, and input/output subsystems and interface hardware. Programming of these systems is studied, including instruction sets, addressing modes, assembly/machine language programming, development of algorithms for data acquisition, display, and process control.
Prerequisite(s): CIS*1910, CIS*2500
Department(s): School of Computer Science
Location(s): Guelph

CIS*2170 User Interface Design Winter Only (LEC: 3, LAB: 2) [0.75]
This course is a practical introduction to the area of user interface construction. Topics include user interface components and their application, best practices for user interface design, approaches to prototyping, and techniques for assessing interface suitability.
Prerequisite(s): 1 of CIS*1200, CIS*1300, CIS*1500
Department(s): School of Computer Science
Location(s): Guelph

CIS*2250 Software Design II Winter Only (LEC: 3, LAB: 2) [0.50]
This course focuses on the process of software design. Best practices for code development and review will be the examined. The software development process and tools to support this will be studied along with methods for project management. The course has an applied focus and will involve software design and development experiences in teams, a literacy component, and the use of software development tools.
Prerequisite(s): CIS*1250, CIS*1300
Restriction(s): Restricted to BCOMP.SENG majors.
Department(s): School of Computer Science
Location(s): Guelph

CIS*2430 Object Oriented Programming Fall Only (LEC: 3, LAB: 2) [0.50]
This course introduces the Object Oriented (OO) approach to programming and algorithm design. Topics will include the creation and use of objects from class libraries, user defined objects, inheritance, modularity, generic code, components, collections and containers, and an introduction to OO design methodologies.
Prerequisite(s): CIS*2500
Department(s): School of Computer Science
Location(s): Guelph

CIS*2500 Intermediate Programming Winter Only (LEC: 3, LAB: 2) [0.50]
In this course students learn to interpret a program specification and implement it as reliable code, as they gain experience with pointers, complex data types, important algorithms, intermediate tools and techniques in problem solving, programming, and program testing.
Prerequisite(s): CIS*1300
Department(s): School of Computer Science
Location(s): Guelph

CIS*2520 Data Structures Fall Only (LEC: 3, LAB: 2) [0.50]
This course is a study of basic data structures, such as lists, stacks, queues, trees, and tables. Topics which will be examined include abstract data types, sequential and linked representations, and an introduction to algorithm analysis; various traversal, search, insertion, removal, and sorting algorithms.
Prerequisite(s): (CIS*2500 or ENGG*1420), (1 of CIS*1910, ENGG*1500, MATH*2000)
Department(s): School of Computer Science
Location(s): Guelph

CIS*2750 Software Systems Development and Integration Winter Only (LEC: 3, LAB: 2) [0.75]
This course introduces techniques and tools used in the development of large software systems. Students learn methods for organizing and constructing modular systems, manipulating files, introductory interface design, and use of databases. Software tools for managing projects, database connectivity, configuration management, and system application programmer interfaces are also covered.
Prerequisite(s): CIS*2520, (CIS*2430 or ENGG*1420)
Department(s): School of Computer Science
Location(s): Guelph

CIS*2910 Discrete Structures in Computing II Winter Only (LEC: 3, LAB: 2) [0.50]
This course is a further introduction to discrete structures and formal methodologies used in computer science, including sequences, summations, recursion, combinatorics, discrete probability, and graph theory.
Prerequisite(s): (CIS*1300 or ENGG*1410), (CIS*1910 or ENGG*1500)
Department(s): School of Computer Science
Location(s): Guelph

CIS*3050 Systems Programming Fall Only (LEC: 3, LAB: 1) [0.50]
This course will familiarize students with system level interface tools and their common applications. The purpose, function, design and use of these tools will be explored, allowing students to determine where and when these tools are useful in software development projects. Tools examined in the course include loadable libraries, file system locking, signals, pipes, asynchronous reading/writing to files and memory, file system sockets, shared memory models, and hardware device properties and control.
Prerequisite(s): CIS*3110
Department(s): School of Computer Science
Location(s): Guelph

CIS*3090 Parallel Programming Fall Only (LEC: 3, LAB: 1) [0.50]
This course examines the current techniques for design and development of parallel programs targeted for platforms ranging from multicore computers to high-performance clusters, with and without shared memory. It includes theoretical models for, and hardware effects on, parallel computation, the definitions of speedup, scalability, and data- versus task-parallel approaches. The course will also examine strategies for achieving speedup based on controlling granularity, resource contention, idle time, threading overhead, work allocation, and data localization.
Prerequisite(s): (CIS*2030 or ENGG*3640), CIS*3110
Department(s): School of Computer Science
Location(s): Guelph

CIS*3110 Operating Systems I Winter Only (LEC: 3, LAB: 1) [0.50]
This course covers operating systems in theory and practice by focusing on the components in a system: scheduling, resource allocation, process management, multi-programming, multi-tasking, I/O control, file systems, and mechanisms for client-server computing using examples from contemporary operating systems.
Prerequisite(s): CIS*2520, (CIS*2030 or ENGG*2410).
Department(s): School of Computer Science
Location(s): Guelph

CIS*3120 Digital Systems I Winter Only (LEC: 3, LAB: 2) [0.50]
This course examines Boolean algebra, minimization of Boolean expressions, design of combinational and sequential logic circuits, memory design, control, ALU, bus design, microprogramming and CPU design.
Prerequisite(s): CIS*1910, CIS*2500
Department(s): School of Computer Science
Location(s): Guelph

CIS*3130 System Modeling and Simulation Fall Only (LEC: 3, LAB: 2) [0.50]
This course examines discrete simulation based on event queues and random number generation. The topics covered include discrete-event simulation models, random number generators, generating random variates and processes, input modeling, model verification and validation. Application areas such as manufacturing, services, and computing are highlighted.
Prerequisite(s): CIS*2500, STAT*2040
Restriction(s): CIS*2460
Department(s): School of Computer Science
Location(s): Guelph

CIS*3150 Theory of Computation Fall Only (LEC: 3) [0.50]
This course explores the theory of computation including automata theory, Turing machines and their variants, formal languages, parsing, the Halting problem, undecidability, and NP-completeness.
Prerequisite(s): CIS*2750, CIS*3490
Department(s): School of Computer Science
Location(s): Guelph

CIS*3190 Software for Legacy Systems Winter Only [0.50]
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.
Offering(s): Offered through Distance Education format only.
Prerequisite(s): CIS*2500 or work experience in a related field.
Department(s): School of Computer Science
Location(s): Guelph

CIS*3210 Computer Networks Fall Only (LEC: 3, LAB: 1) [0.50]
This course covers the high-level (protocol) oriented aspects of computer networks, specifically: application, session, transport and network layers. It includes the Internet, socket-level programming, multimedia and quality of service issues. The hardware aspects (switches, LANs, modems, transmission paths) are only covered at a functional level.
Prerequisite(s): CIS*3110
Department(s): School of Computer Science
Location(s): Guelph

CIS*3250 Software Design III Fall Only (LEC: 3, LAB: 3) [0.50]
This course will examine the historical development of design methodologies and working with legacy systems. It will include an examination of programming paradigms and trends in software design from the past and present. The course has an applied focus and will involve software design and development experiences in teams, a literacy component, and the use of software development tools.
Prerequisite(s): CIS*2250, CIS*2500
Department(s): School of Computer Science
Location(s): Guelph

CIS*3260 Software Design IV Fall Only (LEC: 3, LAB: 3) [0.50]
This course is a study of software architectures and system design methodologies. This will include advanced techniques for project management and experience evaluating software tools. The course has an applied focus and will involve software design and development experiences in teams, a literacy component, and the use of software development tools.
Prerequisite(s): CIS*2750, CIS*3250, CIS*3760
Department(s): School of Computer Science
Location(s): Guelph

CIS*3490 The Analysis and Design of Computer Algorithms Winter Only (LEC: 3, LAB: 2) [0.50]
The design and analysis of efficient computer algorithms are studied. Topics which will be studied include: standard methodologies, asymptotic behaviour, optimality, lower bounds, implementation considerations, graph algorithms, matrix computations (e.g. Strassen's method), NP-completeness.
Prerequisite(s): [CIS*1910 or (CIS*2910 and ENGG*1500)], CIS*2520
Department(s): School of Computer Science
Location(s): Guelph

CIS*3530 Data Base Systems and Concepts Fall Only (LEC: 3, LAB: 1) [0.50]
This course is a study of data organization and data management principles with the perspective of analyzing applications suitable for implementation using a DBMS. This will include an analysis of several data base models, query specification methods, and query processing techniques. Overview of several related issues including concurrency control, security, integrity and recovery. Students will demonstrate concepts through project assignments.
Prerequisite(s): CIS*2520
Department(s): School of Computer Science
Location(s): Guelph

CIS*3700 Introduction to Intelligent Systems Winter Only (LEC: 3, LAB: 1) [0.50]
This course covers the core topics of Artificial Intelligence, namely: agents and environment, search, knowledge representation, reasoning, and learning. The last three topics are covered using logic as the common formalism for coherence. The course introduces a broad range of basic concepts, terminology, and applications, in addition to providing some specific, widely applicable methodologies.
Prerequisite(s): (CIS*3750 or CIS*3760), (CIS*2460 or STAT*2040)
Department(s): School of Computer Science
Location(s): Guelph

CIS*3750 System Analysis and Design in Applications Fall and Winter (LEC: 3, LAB: 2) [0.75]
This course is an introduction to the issues and techniques encountered in the design and construction of software systems, focusing on the theory and models of software evolution. Topics include requirements and specifications, prototyping, design principles, object-oriented analysis and design, standards, integration, risk analysis, testing and debugging.
Prerequisite(s): 9.00 credits including CIS*2520, (CIS*2430 or ENGG*1420)
Department(s): School of Computer Science
Location(s): Guelph

CIS*3760 Software Engineering Fall and Winter (LEC: 3, LAB: 2) [0.75]
This course is an examination of the software engineering process, the production of reliable systems and techniques for the design and development of complex software. Topics include object-oriented analysis, design and modeling, software architectures, software reviews, software quality, software engineering, ethics, maintenance and formal specifications.
Prerequisite(s): CIS*2750, CIS*3750
Department(s): School of Computer Science
Location(s): Guelph

CIS*4010 Cloud Computing Winter Only (LEC: 3) [0.50]
This course introduces students to fundamentals of cloud computing and software development for cloud platforms. It covers topics such as virtualization, architecture of cloud systems, programming for the cloud, resource management, as well as privacy and security issues.
Prerequisite(s): CIS*3110
Department(s): School of Computer Science
Location(s): Guelph

CIS*4020 Data Science Fall Only (LEC: 3, LAB: 1) [0.50]
Data Science focuses on extracting the important relations in data. The course is intended as a survey of the discipline and focuses on applied computational methods for data analysis. Topics include algorithms, computational and machine learning methods, software tools, and modeling, as they apply to the analysis of and discovery in big data.
Offering(s): Offered in odd-numbered years.
Prerequisite(s): CIS*2750, MATH*1160, STAT*2040
Department(s): School of Computer Science
Location(s): Guelph

CIS*4030 Mobile Computing Winter Only (LEC: 3) [0.50]
This course introduces students to mobile computing and mobile application development. It examines mobile technology, application development, user interaction, data storage, and software tools.
Prerequisite(s): CIS*2030, CIS*2750, CIS*3110
Department(s): School of Computer Science
Location(s): Guelph

CIS*4050 Digital Systems II Fall Only (LEC: 3, LAB: 1) [0.50]
This course examines central processor architectures, control and microprogramming, memory systems, special architectures, underlying support for special architectures, architectures suitable for very large scale integration.
Offering(s): Offered in even-numbered years.
Prerequisite(s): CIS*3110, CIS*3120
Department(s): School of Computer Science
Location(s): Guelph

CIS*4150 Software Reliability and Testing Fall Only (LEC: 2, LAB: 2) [0.50]
This course serves as an introduction to systematic methods of testing and verification, covering a range of static and dynamic techniques and their use within the software development process. Concepts such as defining necessary reliability, developing operational profiles, techniques to improve and predict software reliability, preparing and executing tests, black box testing, white box testing, unit testing, system testing, and integration testing will be explained.
Prerequisite(s): 1 of CIS*3750, CIS*3760, ENGG*4450
Department(s): School of Computer Science
Location(s): Guelph

CIS*4250 Software Design V Winter Only (LAB: 6) [0.50]
This is a capstone course which applies the knowledge gained from the previous Software Design courses to a large team project. The course has an applied focus and will involve software design and development experiences in teams, a literacy component, and the use of software development tools.
Prerequisite(s): CIS*2750, CIS*3260
Department(s): School of Computer Science
Location(s): Guelph

CIS*4300 Human Computer Interaction Fall Only (LEC: 2, LAB: 2) [0.50]
This course examines the methods for user interface software design, including interface representations and testing. Topics which will be studied include the evaluation and design of sample application systems, impacts of computer-based information systems on individuals and organizations, implementation and testing tools, and planning of learning stages and design of assistance subsystems.
Prerequisite(s): CIS*3110, (1 of CIS*3750, CIS*3760, ENGG*4450)
Department(s): School of Computer Science
Location(s): Guelph

CIS*4450 Special Topics in Information Science Unspecified (LEC: 3, LAB: 1) [0.50]
A variety of advanced topics mainly from areas within general information processing. Subject areas discussed in any particular semester will depend on the interests of the students and the instructor. Students should check with the School of Computer Science to determine what topic will be offered during specific semesters and which prerequisites, if any, are appropriate.
Restriction(s): Instructor consent required.
Department(s): School of Computer Science
Location(s): Guelph

CIS*4500 Special Topics in Computing Science Unspecified (LEC: 3, LAB: 1) [0.50]
A variety of advanced topics within Computing Science. Subject areas discussed in any particular semester will depend upon the interests of both the students and the instructor. Students should check with the School of Computer Science to determine what topic will be offered during specific semesters and which prerequisites, if any, are appropriate.
Restriction(s): Instructor consent required.
Department(s): School of Computer Science
Location(s): Guelph

CIS*4510 Computer Security Foundations Fall Only (LEC: 3, LAB: 2) [0.50]
This course covers basic concepts and practices in computer and network security. This includes topics such as fundamental concepts of computer security, network security, threat landscape, threat intelligence and attack methods, ethical hacking concepts and other hacking techniques, security technology and security policies, and cloud security.
Prerequisite(s): CIS*3210
Restriction(s): CIS*4110
Department(s): School of Computer Science
Location(s): Guelph

CIS*4520 Introduction to Cryptography Winter Only (LEC: 3, LAB: 2) [0.50]
This course is an introduction to the foundations of modern cryptography, with an eye toward practical applications. Topics covered include classical systems, information theory, mathematical background material, symmetric and asymmetric crypto-systems and their cryptanalysis, hash functions and message authentication (MAC), provable security, key-exchange and management, authentication and digital signatures. Importance of learning Cryptography in Digital Forensics will also be discussed
Prerequisite(s): CIS*3490
Restriction(s): CIS*4110
Department(s): School of Computer Science
Location(s): Guelph

CIS*4650 Compilers Winter Only (LEC: 3, LAB: 1) [0.50]
This course is a detailed study of the compilation process. Topics include interpreters, overall design implementation of a compiler, techniques for parsing, building and manipulating intermediate representations of a program, implementation of important features, code generation and optimization.
Prerequisite(s): CIS*2030, CIS*3110, CIS*3150
Department(s): School of Computer Science
Location(s): Guelph

CIS*4720 Image Processing and Vision Winter Only (LEC: 3, LAB: 1) [0.50]
This course is an introduction to the process of image processing. Emphasis is placed on topics such as image enhancement, segmentation morphological analysis, texture analysis, visualization and image transformations. Applications of image processing in medicine, forensics, food and security are surveyed.
Offering(s): Offered in odd-numbered years.
Prerequisite(s): CIS*2750, CIS*3110, (CIS*2460 or STAT*2040)
Department(s): School of Computer Science
Location(s): Guelph

CIS*4780 Computational Intelligence Unspecified (LEC: 3, LAB: 1) [0.50]
This course introduces concepts of soft computing: modelling uncertainty, granular computing, neurocomputing, evolutionary computing, probabilistic computing and soft computing for software engineering.
Offering(s): Offered in odd-numbered years.
Prerequisite(s): CIS*3490, (CIS*3750 or CIS*3760), (CIS*2460 or STAT*2040)
Department(s): School of Computer Science
Location(s): Guelph

CIS*4800 Computer Graphics Winter Only (LEC: 3, LAB: 1) [0.50]
This course is an introduction to computer graphics. Topics include graphics programming concepts, geometrical transformations, viewing 3-D projections, raster graphics, sculptured surfaces, visible surface determination, image processing and other special topics. Practical issues will be covered by assignment using currently available graphics equipment.
Offering(s): Offered in even-numbered years.
Prerequisite(s): CIS*3110, (CIS*3750 or CIS*3760)
Department(s): School of Computer Science
Location(s): Guelph

CIS*4820 Game Programming Winter Only (LEC: 3, LAB: 1) [0.50]
This course will focus on the components found in modern 3-D game engines. It will emphasize the algorithms and data structures required to create real-time computer graphics, sound and network communications.
Offering(s): Offered in odd-numbered years.
Prerequisite(s): CIS*3110, (CIS*3750 or CIS*3760)
Department(s): School of Computer Science
Location(s): Guelph

CIS*4900 Computer Science Project Summer, Fall, and Winter (LAB: 6) [0.50]
Planning, developing and writing a research proposal under individual faculty supervision. The course, in continuation with CIS*4910 provides senior undergraduates an opportunity to pursue an independent course of study. The topic selected will be determined by agreement between the student and the faculty member with expertise in the area.
Prerequisite(s): 7.00 credits in CIS
Restriction(s): Instructor consent required.
Department(s): School of Computer Science
Location(s): Guelph

CIS*4910 Computer Science Thesis Summer, Fall, and Winter (LAB: 6) [0.50]
This course is a continuation of CIS*4900. The student will conduct and write an undergraduate thesis under the individual supervision of a faculty member. In addition the student is required to present their work in a seminar and also participate in the critical analysis and review of the work of other students taking this course.
Prerequisite(s): CIS*4900
Restriction(s): Instructor consent required.
Department(s): School of Computer Science
Location(s): Guelph