5.7a Course information sheet

Course number and title:	**CENG 241 Digital Design: I**

Calendar reference and course description:*	Page 247 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-3 Boolean algebra, canonical expressions, logic gates and their physical realization. Fan-in and fan-out, timing, rise and fall times, delay. Combinational circuits minimization (Karnaugh map, Quine-McCluskey, Tools-Expresso, others). Standard circuits - adders, multiplexers, demultiplexers, etc. Memory elements, flip-flops. State transition diagrams, Mealy-Moore finite state machines. State assignment and machine realization, counters. Introduction to Verilog and its use to design combinational and sequential circuits. Advanced topics to include design with PLDs, PLAs, FPGAs. Prerequisites: 2nd year standing in Engineering

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	24.8	24.8

Professor-in-charge:	Dr. Fayez Gebali
Other instructors:	Dr. Amirali Baniasadi
Teaching assistants: (number/total hours)	4/315

Major topics:	1. Binary systems 2. Boolean algebra and logic gates 3. Gate level minimization 4. Combinational logic 5. Synchronous sequential logic 6. Registers and counters 7. Memory and programmable logic 8. Register transfer level

Prescribed text(s):	1. Digital Design by M. Mano and M. Ciletti, Fourth Edition, 2004 2. Class notes for CENG 241 by Dr. Gebali, 2009: http://www.ece.uvic.ca/~fayez/uvic_courses/ceng241 3. Laboratory Manual for CENG 241 by Dr. Gebali, 2009: http://www.ece.uvic.ca/~fayez/uvic_courses/ceng241

Laboratory experience:	a) Experiment 1 – Digital Instrumentation b) Experiment 2 – Using ISE Xilinx Tutorial: Schematic Entry and Logic Simulation c) Experiment 3 – combinational circuits: 2-bit Multiplier d) Experiment 4 – 4-bit Binary Adder/Subtractor: Logic Simulation e) Experiment 5 – Sequential circuits: Flip-Flops and counters f) Experiment 6 – Finite State Machines: Mealy and Moore Circuits g) Experiment 7 – A RAM System (Data-path and control Design)

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**CENG 255 Introduction to Computer Architecture**

Calendar reference and course description:*	Page 247 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 The architecture of computer systems including concepts such as CPU, memory, buses, I/O, cache, instruction sets, interrupt processing, pipelining, performance. Families of processors, CISC, RISC. Memory organization and management (including virtual memory, protection, segmentation and paging). Computer arithmetic. The use of assemblers, linkers and loaders. Assembly language programming and its interface with a high level language (C). Prerequisites: CSC 115 or 160

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	30.5	13.1

Professor-in-charge:	Dr. Kin Fun Li
Other instructors:	Dr. Nainesh Agarwal
Teaching assistants: (number/total hours)	3/230

Major topics:	1. Basic structure of computers 2. Machine instructions and programs 3. Input/output organization Memory system 4. Computer arithmetic 5. Processing unit 6. Pipelining

Prescribed text(s):	1. Computer Organization by Hamacher, Vranesic, & Zaky, McGraw Hill, 2002

Laboratory experience:	1. CodeWarrior Development Platform; CodeFire Architecture 2. Implementing Control Structures 3. Procedures and Macro 4. Polling and External Interrupts

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**CENG 355 Microprocessor-Based Systems**

Calendar reference and course description:*	Page 247 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Processor organization: general-purpose and application-specific processors, datapath and control implementation, pipelining concepts. Memory organization: static and dynamic semiconductor memory, optical and magnetic memory, memory hierarchy and caches. I/O organization: physical and logic interfaces, interrupts and interrupt services routines, direct memory access (DMA), device drivers. Buses and protocols: bus signalling and arbitration, examples of modern buses, communications protocol concepts. Computer networking: network topologies, protocol stack, examples of modern networks. Prerequisites: 255, or CSC 230, or MECH 405

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	21.8	21.8

Professor-in-charge:	Dr. Daler N. Rakhmatov
Other instructors:	N/A
Teaching assistants: (number/total hours)	3/205

Major topics:	1. Embedded systems (2 lecture hours) 2. Microprocessor design (6 lecture hours) 3. Memory hierarchy (6 lecture hours) 4. I/O interfacing (9 lecture hours) 5. Internal and external communication (6 lecture hours) 6. Embedded software (4 lecture hours)

Prescribed text(s):	1. Computer Organization, 5th edition by C. Hamacher, Z. Vranesic, and S. Zaky, McGraw-Hill © 2002. 2. CENG 355 – Microprocessor Systems Lab Manual by D. Rakhmatov and D. Vanderster, University of Victoria © 2005. 3. CENG 355 lecture notes.

Laboratory experience:	Project – Sensor display system using MBX860 EDK

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**CENG 412 Human Factors in Engineering**

Calendar reference and course description:*	Page 247 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0 Accidents associated with "human error" often reflect the failure to recognize human factors in the design stage. This course reviews sensory, motor, and cognitive performance characteristics and derives human engineering design criteria. Principles of displays, controls and ergonomics are discussed. Prerequisites: Fourth year standing in the Faculty

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	9.2	11.3	16.9

Professor-in-charge:	Dr. Alexandra Branzan Albu
Other instructors:	N/A
Teaching assistants: (number/total hours)	N/A

Major topics:	1. Research methods in Human factors Engineering (3 lectures) 2. User and task analysis (2 lectures) 3. Design of user system-interfaces (2 lectures) 4. Human information processing (4 lectures) 5. Interaction paradigms (3 lectures) 6. Project development and presentations (4 lectures)

Prescribed text(s):	1. An Introduction to Human Factors Engineering Authors: C. D. Wickens, J. D. Lee, Y. Liu, S. E. Gordon Becker Publisher: Pearson-Prentice Hall Year: 2004

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**CENG 420 Artificial Intelligence**

Calendar reference and description:*	Page 247 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0 Philosophy of artificial intelligence. AI programs and languages, representations and descriptions, exploiting constraints. Rule-based and heuristic systems. Applications to engineering. Prerequisites: Fourth-year standing in the Faculty

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	24.4	13.1

Professor-in-charge:	Dr. Stephen W. Neville
Other instructors:	Dr. Ahmed Ahmed
Teaching assistants: (number/total hours)	N/A

Major topics:	(1.5 hours per Lecture)
	• Preliminary Material:
	  ○ Introduction (1 Lecture)
	  ○ Course project (2 Lectures)
	• Section 1: Predicate Calculus (2 Lectures)
	• Section 2: State Space Searching (2 Lectures)
	• Section 3: Heuristic Search (2 Lectures)
	• Section 4: Game Playing (3 Lectures)
	• Section 5: Control & Knowledge Representation (3 Lectures)
	• Section 6: AI Technologies
	  ○ Expert systems (2 Lectures)
	  ○ Fuzzy Systems (2 Lectures)
	  ○ Neural Networks (2 Lectures)
	  ○ Genetic Algorithms (2 Lectures)

Prescribed text(s):	1. Lecture Notes for CENG 420 Artificial Intelligence, University of Victoria, 2008 2. Artificial Intelligence: Theory + Practice, Thomas Dean, Pearson Education, 2002

Laboratory experience:	A significant course project exits worth 40% of the final grade.

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**CENG 421 Computer Vision**

Calendar reference and course description:*	Page 247 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0 Overview of the main concepts and methods in computer vision; geometry and physics of imaging, as related to image formation and image acquisition; low-level methods of image analysis, such as filtering, edge detection, feature detection, and segmentation; methods for extracting and representing three-dimensional scene information; visual pattern recognition; motion analysis and algorithms for video understanding. Prerequisites: ELEC 310 and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU):	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	13.1	0	0	9.4	15.0

Professor-in-charge:	Dr. Alexandra Branzan Albu
Other instructors:	N/A
Teaching assistants: (number/total hours)	N/A

Major topics:	1. The basics of image formation (2 lectures) 2. Image preprocessing (3 lectures) 3. Image segmentation (4 lectures) 4. Shape description (2 lectures) 5. Pattern recognition (5 lectures)

Prescribed text(s):	1. M. Sonka, V. Hlavac, and R. Boyle, "Image processing, Analysis, and Machine Vision", 3rd edition, Thomson 2008.

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**CENG 441 Design of Digital and VLSI Systems**

Calendar reference and course description:*	Page 247 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Advanced combinational and sequential logic design. Optimization of finite state machines; timing methodologies and synchronization issues. Hardware description languages (HDL): structural and behavioural descriptions, simulation and testbenches, coding styles, design with HDL and FPGA implementation. Design for test: testing concepts, scan-based design and built-in self-test (BIST). Design for high speed: timing analysis, pipelining and retiming. Design for low power: sources of power dissipation, design transformations. Prerequisites: 241 or 290, and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
			X	X	

CEAB curriculum category content (number of AU):	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	13.1	30.5

Professor-in-charge:	Dr. Fayez Gebali
Other instructors:	Dr. Daler N. Rakhmatov
Teaching assistants: (number/total hours)	2/125

Major topics:	1. Digital VLSI systems overview 2. VHDL overview 3. Combinational logic modeling in VHDL 4. Sequential logic and algorithmic state machines 5. Sequential logic modeling in VHDL 6. VHDL RTL synthesis basics 7. Design for testability 8. VLSI design methodology 9. VLSI design options

Prescribed text(s):	1. Class notes for CENG 441 by Dr. Gebali, 2009: http://www.ece.uvic.ca/~fayez/uvic_courses/ceng441 2. Laboratory Manual for CENG 441 by Dr. Gebali, 2009: http://www.ece.uvic.ca/~fayez/uvic_courses/ceng441

Laboratory experience:	1. Project 1: Parallel adders using carry ripple and carry look ahead 2. Project 2: Parallel multipliers using Baugh-Wooley algorithm 3. Project 3: Wash machine controller 4. Project 4: Traffic-light controller

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**CENG 450 Computer Systems and Architecture**

Calendar reference and course description:*	Page 247 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-3 Architecture and performance of modern processors, performance metrics; instruction set architectures and their impact on performance; instruction and arithmetic pipelines; pipeline hazards; exception handling; caches. Integral to the course is a Project Laboratory. Working in teams, students are expected to design and implement a processor based on a given specification of a simple instruction set. Student's progress is determined through a preliminary design review, a presentation, demonstration of the implementation and a final report. Prerequisites: 355 or CSC 355, and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	12.4	37.2

Professor-in-charge:	Dr. Nikitas J. Dimopoulos
Other instructors:	Dr. Amirali Baniasadi
Teaching assistants: (number/total hours)	2/180

Major topics:	1. Performance metrics 2. Instruction set architectures and their impact on performance 3. Instruction and arithmetic pipelines 4. Pipeline hazards 5. Instruction level parallelism 6. Memory hierarchy

Prescribed text(s):	1. Hennessy & Patterson “Computer Architecture A Quantitative Approach” Morgan-Kaufman (2007) Fourth Edition 2. Course notes published on the web (http://www.ece.uvic.ca/~ceng450)

Laboratory experience:	Design and implementation of a pipelined processor on FPGA. A simple instruction set is provided, and the students design, implement, and test architectures that implement the said instruction set. Students present a preliminary design during a preliminary design review (PDR) meeting and at the end of the term, they present their designs to the class and the instructor. They are graded on the performance of their designs as well as their presentation and report.

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	CENG 453 Parallel and Cluster Computing

Calendar reference and course description:*	Page 247 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0 Overview of massively parallel and cluster computers. Processing models (shared memory versus message passing). Processes and threads. Standard algorithms utilizing parallelism. Matrix and vector operations, N-body problems, collective communications. Parallel application environments MPI and OpenMP. The course will include significant exposure to parallel applications including developing and coding parallel codes. Prerequisites: 355 and fourth-year standing

CEAB course type: (indicate with X)	Common core	Program compulsory	Option compulsory	Program elective	Other
				X	

CEAB curriculum category content (number of AU):	Math	Natural science	Complementary studies	Engineering science	Engineering design
	0	0	0	22.5	15.0

Professor-in-charge:	Dr. Nikitas J. Dimopoulos
Other instructors:	Dr. Farshad Khunjush
Teaching assistants: (number/total hours)	N/A

Major topics:	1. Preliminaries. The space of high performance computers 2. Clusters. Commodity nodes and interconnection network strategies. Why performance depends on interconnections 3. Programming. MPI and OpenMP. Develop programming skills through a number of applications. 4. Partition, data decomposition, communication, granularity. 5. The Sieve of Eratosthenes (finding prime numbers) 6. The shortest-path problem 7. Linear algebra (matrix-vector, matrix-matrix multiplication, linear systems) 8. Monte Carlo Methods

Prescribed text(s):	1. M. J. Quinn “Parallel Programming in C and OpenMP” McGraw Hill (2004) 2. Course notes published on the web (http://www.ece.uvic.ca/~ceng453)

Laboratory experience:	Students, as part of their homework, access and develop (MPI and OpenMP) applications on a dedicated cluster (4-dual Opteron nodes).

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**CENG 455 Real Time Computer Systems Design Project**

Calendar reference and course description:*	Page 247-8 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0 Techniques that can be used to guarantee the completion of a computation ahead of its deadline. Scheduling techniques for periodic and non-periodic tasks. Organization and functionality of real time kernels. Students must complete a design project that involves substantial real time software design and implementation. This design experience is based on the knowledge and skills acquired in earlier course work. Students work in teams. Progress is determined through a preliminary design review, presentation, demonstration of the design, and final report. Prerequisites: 355 or CSC 355, and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU):	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	12.4	37.2

Professor-in-charge:	Dr. Kin Fun Li
Other instructors:	N/A
Teaching assistants: (number/total hours)	2/180

Major topics:	1. Characteristics of real time computer systems 2. Experimental and production real time operating system: MQX 3. Interrupts handling; dynamic memory allocation 4. Scheduling considerations, deadline scheduling, time-driven scheduling 5. Deadlocks: detection, avoidance, recovery 6. Processing unit 7. System modeling and verification

Prescribed text(s):	1. Real-time Systems (Jane Liu) Prentice Hall, 2000

Laboratory experience:	1. Introduction to a real time, multitasking environment 2. Introduction to MQX and implementation of serial channels 3. Deadline Driven Scheduler 4. Signal Processor 5. Voice / Data Transmission

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**CENG 460 Computer Networks**

Calendar reference and course description:*	Page 248 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Introduction to computer networking principles and engineering including remote access, wide-area networking, local area networks, network topology, communication hardware and software protocols, open-system-interconnection model, routing and flow control, performance, reliability, security, example networks. Prerequisites: 255 or CSC 230 or MECH 405

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU):	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	17.4	26.1

Professor-in-charge:	Dr. Fayez Gebali
Other instructors:	Dr. Lin Cai
Teaching assistants: (number/total hours)	2/85

Major topics:	1. Communication Networks and Services 2. Applications and Layered Architectures 3. Digital Transmission Fundamentals 4. Circuit-Switching Networks 5. Peer-to-Peer (P2P) Protocols and data Link Layer 6. Medium Access Control (MAC) Protocols and Local Area Networks 7. Packet-Swithcing Networks 8. TCP/IP 9. UDP and ARP Protocols

Prescribed text(s):	1. Leon-Garcia and Widjaja, Communication Networks, second edition, McGraw-Hill 2. Class notes for CENG 460 by Dr. Gebali, 2008: http://www.ece.uvic.ca/~fayez/uvic_courses/ceng460 3. Laboratory Manual for CENG 460 by Dr. Gebali, 2008: http://www.ece.uvic.ca/~fayez/uvic_courses/ceng460

Laboratory experience:	1. Introduction to WireShark and HTTP 2. TCP Trace Analysis 1 3. TCP Trace Analysis 2 and UDP Trace Analysis 4. Ethernet and ARP Protocols

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**CENG 496a Selected Topics Computer Engineering: Advanced Topics in Information Security**

Calendar reference and description:*	Page 248 of the 2008-2009 University of Victoria Undergraduate Calendar CENG 496 Selected Topics in Computer Engineering Units: 1.5, Hours: 3-0 Note: May be taken more than once for credit in different topics to a maximum of 3 units with permission of the Chair of the Department. Prerequisites: The student must be registered in term 4A or 4B.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	9.4	28.2

Professor-in-charge:	Dr. Kin Fun Li
Other instructors:	Dr. Henry Lee
Teaching assistants: (number/total hours)	N/A

Major topics:	1. Enterprise Security Architecture (1 Lecture) 2. International Standards and Best Practices (1 Lecture) 3. Security Threat and Risk Assessment (1 Lecture) 4. Security Education and Awareness (1 Lecture) 5. Monitoring (1 Lecture) 6. Investigations (1 Lecture) 7. Digital Forensics (1 Lecture) 8. Application Security (1 Lecture) 9. Privacy (1 Lecture) 10. Media Handling and Intellectual Property (1 Lecture) 11. Business Continuity Management (1 Lecture) 12. Physical and Environmental Security (1 Lecture) 13. Certificates in Information Security (1 Lecture)

Prescribed text(s):	1. Lecture Notes for CENG496/SENG480A Advanced Topics in Information Security, Henry Lee et al., University of Victoria, 2008 2. Security Engineering, Ross Anderson, Wiley, 2001

Laboratory experience:	Not Applicable

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**CENG 496b Selected Topics in Computer Engineering: Fundamentals of Hybrid Electric Vehicles - Technology Advance, Modeling, Simulation and Design**

Calendar reference and description:*	Page 248 of the 2008-2009 University of Victoria Undergraduate Calendar CENG 496 Selected Topics in Computer Engineering Units: 1.5, Hours: 3-0 Note: May be taken more than once for credit in different topics to a maximum of 3 units with permission of the Chair of the Department. Prerequisites: The student must be registered in term 4A or 4B.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	14.2	0	9.4	28.2

Professor-in-charge:	Dr. Kin Fun Li
Other instructors:	Dr. Zuomin Zong
Teaching assistants: (number/total hours)	1/39

Major topics:	BACKGROUND AND RELATED TECHNOLOGIES 1. Development of Vehicle Technology (0.5 wk) 2. Overview of Hybrid Electric Vehicles (1.5 wk) 3. Generic Vehicle Models (1 wk) 4. Powerplant of HEV (0.5 wk) 5. Electric Propulsion Systems (0.5 wk) 6. Transmission (1.5 wk) 7. Other Key Powertrain Issues (1 wk) 8. Onboard Energy Storage System and Recent Development (1 wk) MODELING, SIMULATION AND DESIGN OPTIMIZATION 9. General Background (0.5 wk) 10. MatLab and Simulink (0.5 wk) 11. ADVISOR - ADvanced Vehicle SimulatOR from NREL (0.25 wk) 12. PSAT - Powertrain System Analysis Toolkit from Argonne NL (1.5 wk) 13. SimDriveline™ & SimPower™ - MathWorks-Simulink Based Mechanical Driveline and Electrical Power Systems Modeling Tools (0.5 wk) 14. Dymola - Dynamic Modeling Laboratory (0.25 wk) 15. Study/ Design of Innovative Hybrid Powertrain Architecture (2 wks) 16. Design Optimization Tools (0.25 wk) 17. Vehicle Powertrain Design Optimization (0.5 wk) Other Issues in HEV Design and Developments (0.5 wk)

Prescribed text(s):	Lecture notes, tutorials and technical papers posted at the course website: http://www.me.uvic.ca/~mech450e/

Laboratory experience:	Tutorials (12 hours) • Modeling of Multiphysics System Using MATLAB Simulink and Stateflow • Modeling of Hybrid Electric Vehicle using PSAT (Powertrain System Analysis Toolkit) Practice of lecture/tutorial materials is carried out by groups in informal gathering HEV Preliminary Design Midterm Project and Presentation HEV Architecture Design Final Project and Presentation

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**CHEM 150** – Engineering Chemistry

Calendar reference:*	**CHEM 150 Units: 1.5 Hours: 3-3** **Engineering Chemistry** Thermochemistry; atomic and molecular structure; chemical bonding; gases, liquids and solids; solutions and phase equilibria; equilibrium; chemical thermodynamics; electrochemistry. Note: Credit will be granted for only one of 150, 100, 101 Prerequisites: Admission to BENG or BSENG program, Mathematics 12 and Chemistry 11 or their equivalents; Chemistry 12 is recommended. Page 248 of the 2008-2009 University of Victoria Undergraduate Calendar.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU): **49.56**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
		49.6 (100%)			

Professor-in-charge:	Matthew Moffitt, PhD Associate Professor, Department of Chemistry
Other instructors:	
Teaching assistants: (number/total hours)	5/18 hours per week

Major topics:	Weeks 1-2 Introduction/Atoms, Molecules, and Ions/Naming Simple Compounds/Aqueous Solutions/Gases. Weeks 3-4 Thermochemistry Weeks 5-8 Atomic Structures Weeks 9-11 Chemical Bonding/Liquids and Solids Weeks 12-14 Thermodynamics

Prescribed text(s):	Zumdahl, Steven and Susan A. Zumdahl. *Chemistry, 7th ed.* Boston: Houghton Mifflin Company.

Laboratory experience:	

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course number and title:	**CSC 111 Fundamentals of Programming with Engineering Applications**

Calendar reference:*	Page 255 of the 2008-09 University of Victoria Undergraduate Calendar **CSC 111 Fundamentals of Programming with Engineering Applications** Units: **1.5**, Hours: **3-2** Fundamentals of computer programming with real-world engineering examples using an imperative programming language. Topics include variables, data types, statements, control structures, functions, parameter passing mechanisms, expressions, data structures, files, pointers, storage allocation, elementary searching and sorting, recursion, encapsulation, modularity, incremental development, testing, and debugging.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
				47.6	

Professor-in-charge:	D. M. Miller, PhD, PEng, Professor, Computer Science
Other instructors:	J. Corless, Senior Instructor, Computer Science
Teaching assistants: (number/total hours)	4/460

Major topics:	• Manual code execution • Variables and data types • Expressions • Functions and parameter passing • Control structures • Arrays • Strings • Testing and Debugging • Elementary searching and sorting • Recursion • Storage allocation and pointers

Prescribed text(s):	Required:	Maarten H. van Emden: Elements of Programming, Andromeda Research Associates, Third Edition, 2009.
	Optional:	Kernighan and Ritchie: The C Programming Language, 2nd Edition, Prentice Hall, 1988. ISBN: 0-13-110370-9

Laboratory experience:	Students gain practical experience with the following topics: **Lab 1:** Introduction to command line interface and compilation **Lab 2:** Introduction to variables, arithmetic expressions and selecting conditions **Lab 3:** Introduction to looping structures and more focus on the integer data type **Lab 4:** Simple debugging, conversion between number bases. **Lab 5:** Functions and Recursion **Lab 6:** Introduction to pointers **Lab 7:** Introduction to arrays, C strings, pointer arithmetic **Lab 8:** Advanced arrays, pointers and pointer arithmetic **Lab 9:** Introduction to input and output using redirection of stdin and stdout **Lab 10:** File input and output in C using fopen, fwrite, fread etc.

*Explanatory notes on inconsistencies with calendar information (if applicable):

NA

Course number and title:	**CSC 115 Fundamentals of Programming: II**

Calendar reference:*	Page 255 of the 2008-09 University of Victoria Undergraduate Calendar **CSC 115 Fundamentals of Programming: II** Units: **1.5,** Hours: **3-2** Techniques, methods, and tools for systematic development and maintenance of software systems and documentation; basic algorithms and data structures; and fundamental concepts of object-oriented programming. Topics include control and data abstraction, modularization, abstract data types, layers of abstraction, information hiding, separation of concerns, type checking, program design, separate compilation, software libraries, techniques for the development of high-quality software components, program understanding.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
				35.7	11.9

Professor-in-charge:	L. Jackson, PhD, PEng applied, Senior Instructor, Computer Science
Other instructors:	Y. Coady, Associate Professor, Computer Science J. Corless, Senior Instructor, Computer Science R. Brown, Sessional Instructor, Computer Science
Teaching assistants: (number/total hours)	7/720

Major topics:	• A review of basic Java programming • The design, definition and manipulation of simple data objects • The implementation of lists, including both sequential (linked) and random access (array) variations • The implementation of stacks, queues, binary trees, and hash tables; with applications • An introduction to polymorphism in Java: class hierarchies, interfaces, and generic types • Problem decomposition using recursion, with emphasis on divide-and-conquer strategies • Techniques for describing the time and space requirements of data structures and their operations • The efficiency of common searching and sorting approaches

Prescribed text(s):	**Required:** Frank M. Carrano and Janet J. Prichard: *Data Abstraction and Problem Solving with Java: Walls and Mirrors* (2nd Ed.), Addison-Wesley, 2005. **Recommended:** Any introductory Java text.
Laboratory experience:	Students gain practical experience in the following topics: Lab #1: Wave Printer -> basic procedural programming (including arrays) in Java Lab #2: Random Sample -> simple object definition and use -> precursor to ArrayList Lab #3: Doubly-Linked List -> maintenance of a chain of object references Lab #4: Linked List Remove and Iterators -> tradeoffs of single vs. double links -> iteration (strategy + position state) is distinct from list Lab #5: Fractal Drawing -> visual representation of recursive division Lab #6: Image Region Filling (via Backtracking) -> visual representation of recursive processing with unknown boundaries (i.e. stopping conditions) Lab #7: Java Collections Framework (i.e. java.util) Lists -> discover and use ADTs provided by the standard Java library -> work with generic collections Lab #8: Palindromes -> utility of LIFO vs. FIFO recording of information Lab #9: Comparators and Binary Search Trees -> many ways to define "order" over a sequence of objects -> objects to encapsulate a strategy (vs. state + operations):comparator -> binary search tree as a Set ADT Lab #10: Merge-sort -> classic example of a Divide-and-Conquer strategy -> straightforward to reason O(n*log(n)) running time

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course number and title:	**CSC 349A Numerical Analysis: I (Spring 2009)**

Calendar reference:*	Page 256 of the 2008-09 University of Victoria Undergraduate Calendar **CSC 349A Numerical Analysis: I** Units: **1.5,** Hours: **3-0** An introduction to selected topics in Numerical Analysis. Typical areas covered: error analysis, roots of equations, systems of linear equations, linear programming, interpolation, numerical

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	22.5			15.0	

Professor-in-charge:	D. Olesky, PhD, Professor, Computer Science
Other instructors:	
Teaching assistants: (number/total hours)	0/0

Major topics:	**Chapter 1** - Mathematical modeling and Engineering Problem Solving **Chapter 2** - MATLAB **Chapter 3** - Approximations and Roundoff Errors **Chapter 4** - Truncation Errors and Taylor Series **Chapter 5, 6, 7** - Roots of Equations: Bisection, Newton, Secant methods; roots of polynomials **Chapter 9** - Gaussian Elimination **Chapter 18** - Interpolation, splines **Chapter 21** - Newton-Cotes Integration **Chapter 22** - Richardson Extrapolation, Romberg integration **Chapter 23** - Numerical Differentiation **Chapter 25** - Runge-Kutta methods

Prescribed text(s):	*Required:* Numerical Methods for Engineers, Fifth edition, 2006 S.C. Chapra and R.P. Canale

Laboratory experience:	There are no labs associated with this course

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course number and title:	**CSC 454 Fault Tolerant Computing**

Calendar reference:*	Page 257 of the 2008-09 University of Victoria Undergraduate Calendar **CSC 454 Fault Tolerant Computing** Units: **1.5,** Hours: **3-0** An introduction to selected issues in fault tolerant computing. Topics include: definitions of reliability, availability, safety, maintainability, testability and dependability; system protection through both hardware and information redundancy; quantitative methods for the evaluation of reliability; the design and test of integrated circuits; software fault tolerence and software testing. The course includes a number of case studies of practical fault tolerant systems.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	9.4			18.8	9.4

Professor-in-charge:	M. Serra, PhD, Professor, Computer Science
Other instructors:	J. Muzio, PhD, Professor, Computer Science
Teaching assistants: (number/total hours)	1/30

Major topics:	• Concepts of reliability, availability, safety, maintainability, testability, dependability • Hardware redundancy, as in Triple Modular Redundancy, Voting Techniques, Standby Sparing, Sift-Out Modular Redundancy • Software testing and fault tolerant systems • Information redundancy, using some types of error detecting/correcting codes • Study of quantitative methods for reliability evaluation (e.g. Markov models) • Distributed fault tolerant systems • Case studies of practical fault tolerant systems

Prescribed text(s):	Required: Barry W. Johnson, Design and Analysis of Fault-Tolerant Digital Systems

Laboratory experience:	There are no labs associated with this course

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course number and title:	ELEC 199 Laboratory in Engineering Fundamentals

Calendar reference:*	Page 275 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1, Hours: 1-1.5-1 The objective of this course is to introduce students to concepts in electrical, computer, and mechanical engineering through a practical project to be undertaken by teams of students. The project will involve mechanical construction, sensing of mechanical quantities by electrical means, as well as interfacing to and programming of a simple microcontroller. Students will be required to acquire suitable components, demonstrate their designs, and write a report documenting their efforts.

CEAB course type: (indicate with X)	Common core	Program compulsory	Option compulsory	Program elective	Other
	X				

CEAB curriculum category content (number of AU):	Math	Natural science	Complementary studies	Engineering science	Engineering design
	0	0	0	14.7	9.8

Professor-in-charge:	Dr. Nikitas J. Dimopoulos
Other instructors:	N/A
Teaching assistants: (number/total hours)	9/602

Major topics:	Week 1 Introductory remarks, description of the Lab, course requirements Weeks 2 and 3 Review of electrical components, electrical circuits, Ohm's Law, Kirchhoff's laws Weeks 4, 5 and 6 Introduction to transistors. Electrons and holes, junctions, transistors. Biasing the transistor, Open Collector circuits. Week 7 MIDTERM Weeks 8 and 9 Brief history of computational devices. Introductory computer architecture. Structure of a computer, the role of memory hierarchies and pipelining. Weeks 10 and 11 Cryptography. Its roots and modern practices. Week 12 Choice of topics from (a) Mobile and cellular systems (b) Signal processing, compression and coding (c) The invention of telephony and how it became a business.

Prescribed text(s):	1. A. Zielinski and N. Dimopoulos *ELEC 199 Laboratory in Engineering Fundamentals: Lab manual* 2. N. Dimopoulos *ELEC 199 notes on the web (www.ece.uvic.ca/~elec199)*

Laboratory experience:	Complete three projects. Project 1 Designing a "solar" racing car Project 2. Hand Gripper Exerciser Project 3. Choose one from (a) Audio amplification (b) Design of a timed lighting source

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 200 Engineering Graphics**

Calendar reference and course description:*	Page 275 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-2 Basic principles of engineering drawing using Computer Aided Design and Drafting; orthographic projections; multiple view drawings; sectional views; electrical schematics; theory of projections for isometric, oblique and perspective pictorial views; computer representation of physical shapes; algorithms for 2-D and 3-D transformations; computation of surface characteristics for data visualization. Prerequisites: CSC 110 or 111, and MATH 133 or 233A

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	11.4	0	0	22.8	11.4

Professor-in-charge:	Dr. Poman So
Other instructors:	Mr. Bernie Till
Teaching assistants: (number/total hours)	4/185

Major topics:	1. Principles of computer aided design and drafting 2. Orthographic projections 3. Multiple view drawings 4. Theory of projections for isometric, oblique and perspective pictorial views 5. Computer representation of physical shapes 6. Algorithms for 2D and 3D transformations 7. Computation of surface characteristics for data visualizatio 8. Data visualization with MatLab

Prescribed text(s):	1. Engineering Drawing and Design, 7th Edition C. Jensen; J. Helsel; D. Short McGraw Hill, 2008 2. Matlab 7 Object-Oriented Programming The MathWorks Inc., 2008 3. Laboratory Manual for ELEC 200 Fil Rossi and Poman So University of Victoria, 2008

Laboratory experience:	1. Introduction to AutoCAD 2. Multi-View Drawings 3. Electrical Engineering Drawings 4. Pictorial Drawing and Solid Modelling 5. Data Visualization with MATLAB

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	ELEC 216 Electricity and Magnetism

Calendar reference:*	Page 275 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-3-1 Electric charge, Coulomb's law, electrostatic forces, electric field, Gauss's law, electric potential, stored energy. Electric current, conduction in a vacuum and in material media, displacement current, magnetic field of a current, force on a current carrying wire, magnetic induction, electromotive force, energy stored in a magnetic field. Magnetism and magnetic circuits. Time varying fields. Capacitance, resistance, inductance, and their characterization. Pre- or corequisites: MATH 200

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	41.7	0	13.9	0

Professor-in-charge:	Dr. Byoung C. Choi
Other instructors:	Dr. Jed Chapin
Teaching assistants: (number/total hours)	7/686

Major topics:	1. Electric charge and Coulomb's law (2 lectures) 2. Electric field (7 lectures) 3. Electric potential (5 lectures) 4. Capacitance (2 lectures) 5. Dielectrics (3 lectures) 6. Currents and circuits (2 lectures) 7. Magnetic field (8 lectures) 8. Induced electromotive force (5 lectures) 9. Magnetism in matter (1 lecture) 10. Maxwell's equations (2 lectures)

Prescribed text(s):	Physics for Scientists and Engineers with Modern Physics by Serway/Jewett, 7th Edition, Thomson Publishing

Laboratory experience:	a) Experiment 1 – Permittivity of free space b) Experiment 2 – Electric fields and potential mapping c) Experiment 3 – The fields of permanent magnets d) Experiment 4 – Superconductivity e) Experiment 5 – The current balance f) Experiment 6 – Electromagnetic induction

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 220 Electrical Properties of Materials**

Calendar reference and course description:*	Page 275 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5 Hours:3-0-1 Materials for engineering, atomic bondings, crystalline structures, properties of metals, glasses, semiconductors, insulators and magnetic materials. Electronic conduction in solids and simple devices. Materials in engineering design and environmental effects. Prerequisites: PHYS 125 or PHYS 112; 216 or PHYS 216 which may be taken concurrently, and MATH 200

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	17.4	0	15.2	10.9

Professor-in-charge:	Dr. Reuven Gordon
Other instructors:	Dr. Tao Lu
Teaching assistants: (number/total hours)	1/52

Major topics:	1. Conductors and resistors (3 lectures) 2. Optical properties of conductors (5 lectures) 3. Insulators and capacitors (4 lectures) 4. Optical properties of insulators (2 lectures) 5. Elasticity and sonic waves in material (6 lectures) 6. Light particles, electron waves, quantum wells, and springs (6 lectures) 7. Degeneracy and symmetry (1 lecture) 8. Free electron waves in metals (4 lectures) 9. Nearly free electrons-bands, gaps, holes and zones (1 lecture) 10. Metal and insulators, quantum mechanical approach (1 lecture) 11. Semiconductors (3 lectures)

Prescribed text(s):	1. Electronic Properties of Engineering Materials by James D. Livingston, John Wiley & Sons, Inc., 1999 2. Supplementary text: 1. Solid State Electronic Devices by Ben G. Streetman, Prentice Hall, 1995 3. Supplementary text 2: Physics of Semiconductor Devices by Michael Shur, Prentice Hall, 1990

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 250 Linear Circuits: I**

Calendar reference and description:*	Page 275-6 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5-1 Circuit analysis and design techniques. Resistors, sources, Kirchoff's voltage and current laws. Theorems: linearity, superposition, Thevenin, Norton. Node and loop analysis. Capacitors and inductors, series and parallel connections, stored energy, initial values. Analysis and design of first- and second-order circuits using differential equations. Forced and natural responses. Phasors, impedance and admittance. Network theorems using phasors. Series and parallel resonance. Coupled inductors, ideal transformer. RMS quantities, complex power. Maximum power transfer. Three-phase circuits, Y- and Delta-loads. Prerequisites: 216 or PHYS 216 and MATH 201 which may be taken concurrently

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	14.9	0	0	34.7	0

Professor-in-charge:	Dr. Stephen W. Neville
Other instructors:	N/A
Teaching assistants: (number/total hours)	9/397

Major topics:	(1.5 hours per Lecture) Chapter 1: Circuit Variables and Circuit Elements (1 Lecture) Chapter 2: Resistive Circuits (1.5 Lectures) Chapter 3: Network Theorems (1.5 Lectures) Chapter 4: Node Voltage Analysis (1.5 Lectures) Chapter 5: Mesh Current Analysis (1.5 Lectures) Chapter 6: Energy Storage Elements (Inductance and Capacitance) (1.5 Lecture) Chapter 7: First-Order RC and RL Circuits (2 Lectures) Chapter 8: Second-Order Circuits (2 Lectures) Chapter 9: Phasors (2 Lectures) Chapter 10: AC Analysis Using Phasors (1.5 Lectures) Chapter 11: AC Power (2 Lectures) Chapter 12: Series and Parallel Resonance (1 Lecture) Chapter 13: Mutual Inductance (1.5 Lectures) Chapter 14: Balanced Three-Phase Circuits (1 Lecture) Chapter 15: Operational Amplifiers (1.5 Lecture)

Prescribed text(s):	1. Lecture Notes for ELEC 250 Electronic Circuits: I, University of Victoria, 2008 2. Laboratory Manual for ELEC 250 Electronic Circuits: I by F. Gebali, NorthStar Digital Design Inc. 3. Fundamentals of Electric Circuits, C.K. Alexander and M.N.O. Sadiku, McGraw-Hill Inc.,2009 (4th Edition)

Laboratory experience:	a) Experiment 1 – Circuit Theorems b) Experiment 2 – Phasors Analysis c) Experiment 3 – Resonance and Power d) Experiment 4 – Transient Analysis

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 260 Signal Analysis**

Calendar reference and course description:*	Page 276 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0-1 Continuous time signals and waveform calculations. The Fourier series in the analysis of periodic signals. The impulse and other elementary functions. Resolution of signals into impulse and unit step functions. The Fourier transform in spectral analysis. Functions of a complex variable. Analytic functions. Partial fractions. The Laplace transform in the representation of signals. Interrelation between the Fourier and Laplace transforms. Prerequisites: 250 which may be taken concurrently, MATH 200 and either 133 or 233A

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU):	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	30.5	0	0	13.1	0

Professor-in-charge:	Dr. Michael Adams
Other instructors:	N/A
Teaching assistants: (number/total hours)	1/52

Major topics:	1. Signals and systems (6 lectures) 2. Linear time-invariant systems (6 lectures) 3. Fourier series (5 lectures) 4. Fourier transform (8 lectures) 5. Laplace transform (8 lectures)

Prescribed text(s):	1. ELEC 260 Coursepack by M.D. Adams, University of Victoria, 2009 2. Optional Text: Signals and Systems by A.V. Oppenheim and A.S. Willsky with S.H. Nawab, 2nd ed., Prentice-Hall, Upper Saddle River, NJ, USA, 1997

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 300 Linear Circuits: II**

Calendar reference and course description:*	Page 276 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Laplace transform analysis and matrix characterization of loop and node circuits. Design of controlled source circuits and ideal operational amplifiers. Feedback in design. Design of complex loads for maximum power transfer. Driving point and transfer function analysis with design for pole and zero placement in simple passive circuits and second order resonant responses, design for stability or oscillation in active circuits. Bode plots. Two-port parameters. Prerequisites: 250 and 260

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	10.9	0	0	19.6	13.1

Professor-in-charge:	Dr. Poman So
Other instructors:	Dr. Jens Bornemann
Teaching assistants: (number/total hours)	5/220

Major topics:	1. Operational amplifiers and applications 2. Frequency Response 3. Laplace Transform 4. Application of Laplace Transform 5. Two-port networks

Prescribed text(s):	1. Fundamentals of Electric Circuits, 4th Edition Charles K. Alexander and Matthew N.O. Sadiku McGraw Hill, 2008 2. PSpice A/D Reference Guide, Product Version 16.0 Cadence Design Systems, Inc., 2008 3. Laboratory Manual for ELEC 300 Adam Zielinski, Revised by Poman So University of Victoria, 2007

Laboratory experience:	1. Dependent sources 2. Frequency response of linear systems 3. Time-domain analysis using the Laplace Transform 4. Analysis and applications of active networks using the Laplace Transform

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 310 Digital Signal Processing: I**

Calendar reference and course description:*	Page 276 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0 Generation of discrete-time signals through the sampling process and their spectral representation. Mathematical representation and properties of digital signal processing (DSP) systems. Typical DSP systems, e.g., digital filters, and applications. The z transform and its relation to the Laurent series. Evaluation of the inverse z transform using complex series and contour integrals. Application of the z transform for representation and analysis of DSP systems. The processing of continuous time signals using DSP systems. The discrete-Fourier transform and the use of fast Fourier transforms for its evaluation. Introduction to the design of DSP systems. Prerequisites: 255 or 260

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	9.4	0	0	18.8	9.4

Professor-in-charge:	Dr. Alexandra Branzan Albu
Other instructors:	Dr. Hong-Chuan Yang, Dr. Xiaodai Dong, Dr. Michael L. McGuire
Teaching assistants: (number/total hours)	N/A

Major topics:	1. Basics of signals and systems 2. Signal sampling and reconstruction 3. Z-transform based discrete-time system analysis 4. Discrete Fourier transforms and their application in discrete-time system analysis 5. Convolution and correlation 6. Digital filter specification and design.

Prescribed text(s):	1. Fundamentals of Digital Signal Processing using Matlab by R. J. Schilling and S. L. Harris, Thomson, 2005

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**ELEC 320 Electronic Devices: I**

Calendar reference and course description:*	Page 276 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Electronic properties of silicon. Charge carriers, mobilities and carrier transport. Continuity equation. Properties and characteristics of ideal and non-ideal PN junctions. Zener and tunnel diodes. Properties and characteristics of metal-insulator-semiconductor (MIS) structures. Basic operation of bipolar transistors (BJT) and metal-oxide field effect transistors (MOSFET). Small-signal models and equivalent circuits. Design considerations with respect to transistor performance. Prerequisites: 220

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU):	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	10.9	0	21.8	10.9

Professor-in-charge:	Dr. Chris Papadopoulos
Other instructors:	Dr. Harry H.L Kwok
Teaching assistants: (number/total hours)	5/215

Major topics:	1. Review of Electrical Properties of Materials. 2. Junctions and Diodes. 3. Bipolar Transistors. 4. Field Effect Transistors.

Prescribed text(s):	1. Modular Series on Solid State Devices, I-IV, by Pierret and Neudeck, Addison-Wesley, Second Edition. 2. by C. Papadopoulos. 3. Reference text 1: Solid State Electronic Devices by Streetman. 4. Reference text 2: An Introduction to Semiconductor Devices by Neamen.

Laboratory experience:	a) Experiment 1 – Hall Effect. b) Experiment 2 – P-N Junction Diode. c) Experiment 3 – Bipolar Junction Transistor (BJT). d) Experiment 4 – Metal-Oxide Semiconductor Field-Effect Transistor (MOSFET).

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 330 Electronic Circuits: I**

Calendar reference:*	Page 276 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Nonlinear devices. Modelling and application of diodes: rectifiers, voltage regulators, waveform shaping circuits. Biasing of bipolar and field effect transistors. Small signal amplifiers. Multistage amplifiers. Nonlinear applications of transistors. Circuit design, simulation, implementation and testing. Prerequisite: 250

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	19.6	24.0

Professor-in-charge:	Dr. Adam Zielinski
Other instructors:	Dr. Paul Kraeutner
Teaching assistants: (number/total hours)	5/250

Major topics:	1. Nonlinear devices (3 lectures) 2. Modelling and applications of diodes (4 lectures) 3. Special-purpose diodes and other applications (2 lectures) 4. Characteristic and modelling of bipolar transistors (2 lectures) 5. DC load lines (1 lecture) 6. Transistor biasing circuits (2 lectures) 7. Transistor amplifiers (small signal) (6 lectures) 8. Voltage regulators (2 lectures) 9. Junction field-effect transistor (JFET) (5 lectures) 10. Other applications of JFET (3 lectures) 11. Metal-oxide semiconductor FET (MOSFET) (3 lectures) 12. H-parameters for bipolar transistors (3 lectures)

Prescribed text(s):	1. Class Notes for ELEC 330 Electronic Circuits: I by A. Zielinski, University of Victoria, 2008 2. Laboratory Manual for ELEC 330 Electronic Circuits: I by A. Zielinski, University of Victoria, revised November 2008 3. Supplementary text 1: Electronic Circuit Analysis and Design by D.A. Neaman, McGraw Hill, 2007 4. Supplementary text 2: Electronic Devices by T.L. Floyd, Prentice-Hall, 2008

Laboratory experience:	a) Experiment 1 – Application of diodes; rectifiers and regulators b) Experiment 2 – Transistor characteristics, modelling and biasing c) Experiment 3 – Transistor amplifiers d) Experiment 4 – Junction field-effect transistors and amplifiers

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 340 Electromagnetic Field Theory**

Calendar reference and course description:*	Page 276 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Field concept, Maxwell's equations. Boundary conditions. Power and energy. Constitutive parameters. Polarization. Plane waves in free space and materials. Plane wave reflection and transmission at material interfaces. Engineering design, general concepts and examples. Design of quarter wave and half wave transformers. Shielding design. Prerequisites: 216 or PHYS 216; 260

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	15.2	0	17.4	10.9

Professor-in-charge:	Dr. Poman So
Other instructors:	N/A
Teaching assistants: (number/total hours)	4/190

Major topics:	1. Introduction, vector algebra, coordinate systems, fields vector integration 2. Integral form of Maxwell's equations, displacement current 3. Vector integration and differentiation, divergence, divergence theorem, curl, Stoke's theorem, Maxwell's equations in differential form, continuity equation 4. Wave equation, harmonic fields, uniform plane waves in free space, polarization 5. Electrical characteristics of materials, dielectric polarization, Maxwell's equations in material regions 6. Boundary conditions, waves in conductive media, Poynting vector 7. Normal-incidence plane wave reflection and transmission, multiple reflections, transformers 8. Plane wave propagation at arbitrary angle

Prescribed text(s):	1. Engineering Electromagnetics, 7th Edition W.H. Hayt, J.A. Buck McGraw-Hill, 2006 2. Laboratory Manual for ELEC 340 Poman So University of Victoria, 2007 3. MEFiSTo User Guide Faustus Scientific Corporation, 2005

Laboratory experience:	1. Static Electric and Magnetic Fields 2. Time-Varying Electromagnetic Fields 3. The Uniform Plane Wave 4. Plane Wave Reflection and Transmission

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 350 Communications Theory and Systems: I**

Calendar reference and course description:*	Page 276 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Principles of amplitude, frequency and phase modulation; design of communication systems using link budget; modulators, mixers and demodulators; elementary digital communications, PSK, FSK. System analysis using Matlab; random processes, power spectral density, noise in communication systems, matched filters. Prerequisites: 310 and 330

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	26.1	17.4

Professor-in-charge:	Dr. Peter Driessen
Other instructors:	Dr. T. Aaron Gulliver
Teaching assistants: (number/total hours)	4/210

Major topics:	1. Introduction to communication systems (2 lectures) 2. Link budget (3 lectures) 3. Review of Fourier analysis (2 lectures) 4. Spectral density and correlation, spectrum analyzer (2 lectures) 5. Amplitude modulation (12 lectures) 6. Angle modulation (13 lectures) 7. Digital modulation (5 lectures)

Prescribed text(s):	1. Analog and Digital Communication Systems by S. Haykin, M. Moher, Wiley, 2006

Laboratory experience:	Experiment 1 – Amplitude modulation: Generation of AM double sideband (DSB) and single sideband signals (SSB) Experiment 2 – Reception and demodulation of AM, DSB, and SSB signals Experiment 3 – Frequency modulation: Generation of FM signals Experiment 4 – Frequency demodulation: Reception and demodulation of FM signals

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 360 Control Theory and Systems: I**

Calendar reference and course description:*	Page 276 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Characterization of systems: linearity, time invariance, and causality. General feedback theory; time and frequency domain analysis of feedback control systems; Routh-Hurwitz and Nyquist stability criteria; root locus methods; modelling of dc servos; design specifications and system performance; design of PID controllers; lead and lag compensators; introduction to state-space methods. Prerequisites: 255 or 260

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	28.3	15.2

Professor-in-charge:	Dr. Hong-Chuan Yang
Other instructors:	Dr. Pan Agathoklis, Dr. Fayez Gebali, Dr. Michael L. McGuire
Teaching assistants: (number/total hours)	1/60

Major topics:	1. Introduction to control systems 2. Mathematical modeling of dynamic systems 3. Characteristics of feedback control systems 4. Time domain analysis 5. Stability analysis 6. Frequency response analysis 7. Basic control system design

Prescribed text(s):	1. Modern Control Systems, 11th Ed, by R. C. Dorf and R. H. Bishop, Prentice, 2008 2. Laboratory Manual for ELEC 360 Control Theory and Systems: I, by P. Agathoklis, University of Victoria, 2003

Laboratory experience:	a)	Experiment 1 – Components of a D.C. servo system
	b)	Experiment 2 – Speed control using a D.C. servo system
	c)	Experiment 3 – Position control using a D.C. servo system
	d)	Experiment 4 – Introduction to the programming of a robot arm

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 370 Electromechanical Energy Conversion**

Calendar reference and course description:*	Page 276 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Faraday's law of electromagnetic induction, transformers and generators. Magnetic circuits. Force on a current carrying wire and motors. Energy and coenergy in the derivation of torques and forces. Structures and performance characteristics of dc, induction and synchronous machines. Stepper motor and brushless dc machines. Introduction to electric drives. Prerequisites: 250

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	30.5	13.1

Professor-in-charge:	Dr. Ashoka K.S. Bhat
Other instructors:	Dr. Subhasis Nandi
Teaching assistants: (number/total hours)	3/222

Major topics:	1. Magnetic Circuits (5 hours) 2. Transformers (8 hours) 3. DC Machines (8 hours) 4. Induction Motors (7 hours) 5. Synchronous Machines (4 hours) 6. Electromechanical Energy-Conversion Principles (2 hours) 7. Stepper Motor and Brushless DC Machines (1 hours) 8. Electric Drives (2 hours)

Prescribed text(s):	1. Principles of Electric Machines and Power Electronics by P.C. Sen, John Wiley & Sons, Second Edition, 1996. 2. Laboratory Manual for ELEC 370 – Electromechanical Energy Conversion, A.K.S. Bhat, University of Victoria, 2008. 3. Course Notes for ELEC 370, A.K.S. Bhat, 2008.

Laboratory experience:	a) Experiment 1 – Iron-core Transformer b) Experiment 2 – DC Generators c) Experiment 3 – DC Motors: Speed Control d) Experiment 4 – Three-Phase Induction Motor: Conventional Operation e) Experiment 5 – Three-Phase Induction Motor: Speed Control (Demonstration) f) Experiment 6 – Synchronous Generator and Motor (Demonstration) g) Experiment 7 – DC Motor Speed Control Using Phase Controlled Converter (Demonstration)

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	ELEC 380 Electronic Circuits: II

Calendar reference and description:*	Page 276 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-3 Power amplifiers. Linear and nonlinear distortion. High frequency models for transistors. Differential amplifiers. Operational amplifiers, their parameters and models. Negative feedback. Applications of operational amplifiers: instrumentation amplifiers, comparators, precision rectifiers. Oscillators and timers. Circuit design, simulation, implementation and testing. Prerequisites: 300 and 330

CEAB course type: (indicate with X)	Common core	Program compulsory	Option compulsory	Program elective	Other
		X			

CEAB curriculum category content (number of AU):	Math	Natural science	Complementary studies	Engineering science	Engineering design
	0	0	0	14.9	34.7

Professor-in-charge:	Dr. Adam Zielinski
Other instructors:	Dr. Mihai Sima
Teaching assistants: (number/total hours)	4/360

Major topics:	1. Material review (3 lectures) 2. Power (large-signal) amplifiers (3 lectures) 3. Frequency response of transistor amplifiers (3 lectures) 4. Current sources and differential amplifiers (4 lectures) 5. Negative feedback (all topologies) (8 lectures) 6. Ideal and non-ideal operational amplifiers (2 lectures) 7. Applications of operational amplifiers (2 lectures) 8. Active filters (2 lectures) 9. Lab-related problems addressed in class (3 lectures) 9. Practice examples for midterm and final (4 lectures) 10. Midterm solutions and results (1 lecture) (There were 36 one-hour lectures)

Prescribed text(s):	1. Analysis and Design of Analog Integrated Circuits by Gray and Meyer, 4th edition. 2. Laboratory Manual for ELEC 380 Electronic Circuits: II by A. Zielinski, University of Victoria, revised August 2008 3. Supplementary text 1: Electronic Circuit Analysis and Design by D.A. Neaman, McGraw Hill, 2007

Laboratory experience:	a) Experiment 1 – Design and testing of a two-stage amplifier b) Experiment 2 – Large signal amplifiers c) Experiment 3 – Frequency Response of an amplifier d) Experiment 4 – Differential amplifier e) Experiment 5 – Parameters of an operational amplifier f) Experiment 6 – Instrumentation amplifier g) Experiment 7 – Nonlinear circuits h) Experiment 8 – Design of a low-pass filter (Total: 24 hours)

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 395 Seminar**

Calendar reference and description:*	Page 276 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.0, Hours: 2-0 The main purpose of this course is to provide students with an opportunity to exercise their ability to present and to defend their thought on professional topics of their own choice. Students will be encouraged to devote some of their discussions to such topics as continuing professional education, professional societies and organization of engineering employment. Students will also be made aware of the role and responsibilities of Professional Engineers in society with respect to the environment, ethics, equity, public and worker safety and health considerations. Prerequisites: Completion of term 1B and one work term

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU):	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	18.8	6.3	0

Professor-in-charge:	Dr. Harry H.L. Kwok
Other instructors:	Mr. Scott Miller
Teaching assistants: (number/total hours)	4/239

Major topics:	Students are required to: 1. Learn the principles and techniques related to preparing and delivering effective technical presentations 2. Improve the ability to give effective presentations through practice and peer review 3. Explore technical and professional engineering subjects 4. Be acquainted with the roles and responsibilities of Professional Engineers in society including issues related to the environment, ethics, equity, work safety and health considerations.

Prescribed text(s):	1. Class Notes for ELEC 395 Seminar by H. Kwok, University of Victoria, 2008 2. The complete speaker – An Introduction to Public Speaking by B.D. Peterson, E.G. Stephen and N.D. White, 3rd ed., West Publishing Company, N.Y. 1999

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

This course is graded pass or fail.

Course number and title:	**ELEC 403 Engineering Design by Optimization**

Calendar reference and course description:*	Page 276 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 The steepest descent and Newton methods for unconstrained optimization. Golden section, quadratic, cubic and inexact line searches. Conjugate and quasi-Newton methods. The Fletcher-Reeves algorithm. Application to the design of circuits, control systems, filters, and mechanical systems using optimization techniques. Introduction to constrained optimization. The course includes laboratory sessions to program various optimization algorithms and to apply them to several modeling and engineering problems. Prerequisites: ELEC 310 or CSC 349A, and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
			X	X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	17.4	0	0	15.2	10.9

Professor-in-charge:	Dr. Wu-Sheng Lu
Other instructors:	N/A
Teaching assistants: (number/total hours)	1/80

Major topics:	1. Basic principles (7 lectures) 2. General properties of algorithms (1 lecture) 3. One-dimensional optimization (line search) (6 lectures) 4. Basic multidimensional gradient methods (7 lectures) 5. Conjugate direction methods (4 lectures) 6. Quasi-Newton methods (6 lectures) 7. Case studies (6 lectures)

Prescribed text(s):	1. Practical Optimization: Algorithms and Engineering Applications, by A. Antoniou and W.-S. Lu, Springer 2007. 2. Laboratory Manual for ELEC 403 Engineering Design by Optimization by W.-S. Lu, University of Victoria, revised March 2008.

Laboratory experience:	a) Experiment 1 – An Introduction to MATLAB b) Experiment 2 – Design of a Five-Tap Digital Filter for Noise Removal c) Experiment 3 – Application of the Steepest Descent and Newton's Methods to a Material Optimization Problem d) Experiment 4 – Design of a Band-Limited Differentiator for Velocity Estimation Based on Noisy Position Data

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 404 Microwaves and Fiber Optics**

Calendar reference and course description:*	Page 276 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Transmission line theory, Smith chart and design examples, transmission lines and waveguides, network analysis, design of impedance matching and tuning networks, aspects of coupled lines, radiation and amplification, optical fibers, numerical aperture, single mode and multimode fibers, chromatic dispersion, fiber optic components. Prerequisites: 300 and 340, and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
			X	X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	10.9	0	19.6	13.1

Professor-in-charge:	Dr. Thomas Darcie
Other instructors:	N/A
Teaching assistants: (number/total hours)	1/80

Major topics:	1. Introduction and Fundamentals (3 hours) **Microwave Engineering:** 2. Transmission Line Theory (4.5) 3. Waveguide theory (4.5) 4. Couplers and Coupled Lines (1.5) 5. Network Analysis (3) 6. Smith Chart and Load Matching (3) 7. Antennas (1.5) 8. Impedance Matching and Tuning (3) 9. Amplifier Fundamentals (1.5) **Optical Fiber Engineering:** 10. Optical Fiber Communications Overview (1.5) 11. Modes and Propagation in Optical Fiber (3) 12. Impairments in Optical Fiber (1.5) 13. Optical Waveguide Devices (1.5)

Prescribed text(s):	1. Required Text: Microwave Engineering, D.M. Pozar, John Wiley & Sons, 2005 (3rd ed.) 2. Optical Fiber Communications, G. Keiser, McGraw-Hill, 2000 (3rd ed.) (Out of print – course-pack available) 3. Laboratory Manual for ELEC 404 - Microwave and Fiber Optics, T. Darcie, P. Fedrigo, R. Vahldieck, J. Bornemann, University of Victoria, 2005

Laboratory experience:	1. Standing Waves and Impedance Measurements Using Slotted Line 2. Microwave Couplers and Network Analysis 3. Microwave Antennas 4. Basic Fiber Optic Measurements and Transmission

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 405 Error Control Coding and Sequences**

Calendar reference and course description:*	Page 276 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0 Coding approaches and characteristics; linear block codes, convolutional code structure and Viterbi decoding; automatic repeat request techniques; trellis coded signalling; sequence design, error control in data storage systems and in information transmission. Prerequisites: Fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	9.4	0	0	15.0	13.1

Professor-in-charge:	Dr. T. Aaron Gulliver
Other instructors:	Dr. Xiaodai Dong
Teaching assistants: (number/total hours)	N/A

Major topics:	1. Fundamental concepts of coding (2 lectures) 2. Vector spaces and Galois fields (6 lectures) 3. Linear block codes (6 lectures) 4. Cyclic codes, BCH and RS codes (10 lectures) 5. Convolutional codes and Viterbi decoding (7 lectures) 6. Sequences (6 lectures)

Prescribed text(s):	1. Error Control Systems for Digital Communication and Storage, Stephen B. Wicker, Pearson Prentice Hall, Englewood Cliffs, NJ, 1995.

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**ELEC 407 Digital Signal Processing: II**

Calendar reference and course description:*	Page 276-7 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0 Characterization of digital signal processing (DSP) systems. Frequency-domain and stability analysis. Design methodology. Structures for recursive and nonrecursive digital filters. VLSI implementation. Solution of the approximation problem for nonrecursive digital filters through the Fourier series. Solution of the approximation problem for recursive digital filters through the transformation of Chebyshev, inverse-Chebyshev, and elliptic analog filter approximations. Design for recursive digital filters satisfying prescribed specifications. Finite word-length effects. Applications. Prerequisites: 310 and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
			X	X	

CEAB curriculum category content (number of AU):	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	9.4	0	0	13.1	15.0

Professor-in-charge:	Dr. Michael L. McGuire
Other instructors:	N/A
Teaching assistants: (number/total hours)	N/A

Major topics:	1. Characterization and properties of DSP systems (3 lectures) 2. Time and frequency-domain analysis of DSP systems (3 lectures) 3. The design of DSP systems (4.5 lectures) 4. The realization process (4.5 lectures) 5. The approximation problem for non-recursive digital filters (6 lectures) 6. The approximation problem for recursive digital filters (6 lectures) 7. The design of recursive digital filters satisfying prescribed specifications (3 lectures) 8. Study of finite-wordlength effects in DSP systems (4 lectures) 9. Application (3 lectures)

Prescribed text(s):	1. Digital Signal Processing: Signals, Systems, and Filters by A. Antoniou, McGraw-Hill, 2006 2. Supplementary Lectures Notes M. McGuire, 2006

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**ELEC 410 Power Electronics**

Calendar reference and course description:*	Page 277 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Electronics in energy conversion and control. Circuits with switches and diodes. Electrical and thermal characteristics of power semiconductor devices: diodes and thyristors; bipolar, field effect and insulated gate transistors. Phase controlled converters: ac-to-ac and ac-to-dc. Dc-to-dc converters including switching regulators. Voltage source inverters. Pulse-width modulation and harmonic elimination techniques. Emphasis on device limitations, computer aided analysis and system control. Application examples including solar power conversion and battery chargers. Prerequisites: 370 and 380, and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
			X	X	

CEAB curriculum category content (number of AU):	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	21.8	21.8

Professor-in-charge:	Dr. Ashoka K.S. Bhat
Other instructors:	Mr. Akshay Rathore
Teaching assistants: (number/total hours)	4/175

Major topics:	1. Introduction (1 hour) 2. Circuits with Switches and Diodes (4 hours) 3. Power Semiconductor Switches (5 hours) 4. Controlled Half-wave Rectifier (1.5 hours) 5. AC Voltage Controllers (4 hours) 6. Full-Wave Controlled Rectifiers (5 hours) 7. DC-to-DC Converters – 1 (Choppers) (4.5 hours) 8. Switching Regulators (DC-to-DC Converters - 2) (3 hours) 9. Inverters (5 hours) 10. Resonant inverters and converters (2 hours) 11. Current Source Inverters (1 hour) 12. Application Examples (1 hour)

Prescribed text(s):	1. Power Electronic Circuits by Issa Batarseh, John Wiley and Sons, 2004. 2. Laboratory Manual for ELEC 410 – Power Electronics, A.K.S. Bhat, University of Victoria, 2008. 3. Course Notes for ELEC 410, A.K.S. Bhat, 2009.

Laboratory experience:	a) Experiment 1 – Single-Phase Half-Wave Controlled Rectifier b) Experiment 2 – Single-Phase AC Voltage Controller c) Experiment 3 – Single-Phase Full-Wave Controlled Rectifier d) Experiment 4 – One-Quadrant Chopper or DC-to-DC Converter e) Experiment 5 – Single-Phase Voltage-Source Inverter f) Experiment 6 – Single-Phase Current-Source Inverter (Only experiment numbers 2 to 5 to be performed)

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 412 Electronic Devices: II**

Calendar reference and description:*	Page 277 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0 Study of the operation of bipolar and field-effect devices in VLSI design. Study of photon and opto-electronic devices used in transmission, modulation and demodulation and receivers. Principles, construction and design of lasers and their applications. Study of display devices, thin-film devices, imaging devices, transducers and micromachines and their interfacing. Sensor arrays and related system design. Prerequisites: 320 and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
			X	X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	11.3	0	13.1	13.1

Professor-in-charge:	Dr. Harry H.L. Kwok
Other instructors:	N/A
Teaching assistants: (number/total hours)	N/A

Major topics:	1. Study of the operation of bipolar and field-effect devices in VLSI design (9 lectures) 2. Study of photon and opto-electronic devices used in transmission, modulation and demodulation and receivers (6 lectures) 3. Principles, construction and design of lasers and their applications (6 lectures) 4. Study of display devices, thin-film devices, imaging devices, transducers and micromachines and their interfacing (12 lectures) 5. Sensor arrays and related system design (3 lectures)

Prescribed text(s):	1. Class Notes for ELEC 412 Electronic devices: II by H. Kwok, University of Victoria, 2008 2. Physics of Semiconductor Devices, M. Shur, Prentice Hall, 1990. 3. Semiconductor Devices, Physics and Technology, S.M. Sze, J. Wiley, 1985.

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**ELEC 420 Nanotechnology**

Calendar reference and course description:*	Page 277 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0 Nanoscale materials and devices. Techniques and tools of nanostructure fabrication and characterization. Properties of low-dimensional materials. Semiconductor nanostructures, metallic nanoparticles, carbon nanotubes, organic molecules, quantum dots. Applications including nanoelectronics and molecular devices, biotechnology, nanoscale computation, nanomechanical devices and nanophotonics. Prerequisites: 320 and fourth-year standing, or permission of the department

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	11.3	0	13.1	13.1

Professor-in-charge:	Dr. Chris Papadopoulos
Other instructors:	N/A
Teaching assistants: (number/total hours)	N/A

Major topics:	1. Nanostructure Synthesis and Characterization. 2. Properties of Nanoscale Materials. 3. Nanoelectronics. 4. Nanophotonics. 5. Bionanotechnology.

Prescribed text(s):	1. Nanomaterials, by Vollath, Wiley-VCH, 2008. 2. Reference text 1: Nanoelectronics and Information Technology, by Waser (Ed.), Wiley-VCH, 2005.

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**ELEC 426 Robotics**

Calendar reference and course description:*	Page 277 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Structure and specification of robot manipulators. Homogenous transformations. Link description. Manipulator kinematics. Inverse manipulator kinematics. Velocity and static forces in manipulators. An introduction to manipulator dynamics. Linear control of robot motion. Model-based nonlinear control of robot manipulators. Prerequisites: 360, MECH 141 or 245, PHYS 122, and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU):	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	30.5	13.1

Professor-in-charge:	Dr. Wu-Sheng Lu
Other instructors:	Dr. Flavio Firmani, Dr. Gabriele Gilardi
Teaching assistants: (number/total hours)	2/125

Major topics:	1. Introduction to robotics (3 lectures) 2. Spatial descriptions and transformations (4 lectures) 3. Manipulator forward kinematics (4 lectures) 4. Manipulator inverse kinematics (4 lectures) 5. Trajectory generation (4 lectures) 6. Jacobians: velocities and static forces (6 lectures) 7. Manipulator dynamics (6 lectures) 8. Control of manipulator (4 lectures)

Prescribed text(s):	1. Class Notes for ELEC 426 Robotics by F. Firmani, University of Victoria, 2005. 2. Supplementary text: Introduction to Robotics - Mechanics and Control by J. J. Craig, 3rd Edition, Pearson Prentice Hall, Upper Saddler River, NJ, 2005. 3. Laboratory Manual for ELEC 426 Robotics: II (CRS Plus) by D. K. Fenger and W.-S. Lu, University of Victoria, 2003.

Laboratory experience:	a) Experiment 1 - Introduction to CRS Plus robotic system b) Experiment 2 - Motion control using inverse kinematics c) Experiment 3 - Path tracking using inverse kinematics d) Experiment 4 - Robot-conveyor system integration

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 450 Communications Theory and Systems: II**

Calendar reference and course description:*	Page 277 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Transmission and filtering of random signals, analysis of modulation systems, in particular pulse code modulation, phase shift keying, frequency shift keying, etc., design of modems and of CODECs, introduction to noise analysis, information theory and coding. Prerequisites: 350 and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
			X	X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	10.9	0	0	15.2	17.4

Professor-in-charge:	Dr. Michael L. McGuire
Other instructors:	Dr. Xiaodai Dong
Teaching assistants: (number/total hours)	2/107

Major topics:	1. Geometric representation of signals and the matched filter (10 lectures) 2. The sampling process (3 lectures) 3. Pulse-digital modulation (6 lectures) 4. Baseband data transmission (6 lectures) 5. Digital modulation techniques (8 lectures) 6. Information theory and coding (3 lectures)

Prescribed text(s):	1. Digital Communications: Fundamentals and Applications by B. Skylar, Prentice-Hall, 2nd Edition, 2001 2. Laboratory manual for ELEC 450 Communications Theory and Systems: II by P.F. Driessen, University of Victoria, 1996, Revised March 2007.

Laboratory experience:	a) Experiment 1 – Sampling and pulse modulation, PAM/PPM/PWM b) Experiment 2 – Pulse-digital modulation, PCM/DPCM/DM c) Experiment 3 – Simulation of a digital communication system in additive white Gaussian noise channel d) Experiment 4 – Detection of signals in noise

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 452 Optical Communication Technology**

Calendar reference and course description:*	Page 277 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Optical Communication Technology Covers the technology associated with optical communication. Topics include waveguiding in fibers, dispersion and loss in propagation, LEDs and semiconductor lasers, photo detectors, noise, link budgeting, optical filters and wavelength-division multiplexing, optical amplifiers and optical networks. Prerequisites: 320 and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
			X	X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	10.9	0	21.8	10.9

Professor-in-charge:	Dr. Reuven Gordon
Other instructors:	Dr. Tao Lu, Dr. Vladimir Labay
Teaching assistants: (number/total hours)	1/45

Major topics:	1. Overview of optical fiber communications (1 lecture) 2. Optical fibers: structures, wavguiding, and fabrication (9 lectures) 3. Signal degradation in optical fibers (5 lectures) 4. Optical sources (8 lectures) 5. Photodetectors (7 lectures) 6. Optical receiver operation (2 lectures) 7. WDM concepts and components (4 lectures)

Prescribed text(s):	1. Optical Fiber Communications by Gerd Keiser, McGraw-Hill, 2000 2. Supplementary text 1: Fiber-optic Communication Systems by Govind P. Agrawal, John Wiley & Sons, Inc., 2002

Laboratory experience:	a) Experiment 1 - Optical fibers b) Experiment 2 - Propagation and polarization in optic fibers c) Experiment 3 - Coupling into fibers d) Experiment 4 - Semiconductor lasers

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	ELEC 453 Antennas and Propagation

Calendar reference:*	Page 277 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0 Antenna and propagation fundamentals, Friis transmission formula, radar equation, Maxwell's equations for radiation problems, antenna parameters, simple radiators, array theory, mutual coupling, wire and broadband antennas, aperture radiators, scattering and diffraction, multipath propagation and fading, antenna measurement techniques, surface-wave and ionospheric propagation, microwave and millimeter-wave propagation. Prerequisites: 404 and fourth-year standing

CEAB course type: (indicate with X)	Common core	Program compulsory	Option compulsory	Program elective	Other
			X	X	

CEAB curriculum category content (number of AU):	Math	Natural science	Complementary studies	Engineering science	Engineering design
	0	0	0	24.4	13.1

Professor-in-charge:	Dr. Jens Bornemann
Other instructors:	N/A
Teaching assistants: (number/total hours)	N/A

Major topics:	1. Introduction (1 lecture) 2. Fundamental Parameters of Antennas and Propagation (2) 3. Propagation (3) 4. Potential Functions (1) 5. Wire Antennas (3) 6. Antenna Arrays (2) 7. Aperture and Horn Antennas (2) 8. Microstrip Antennas (2) 9. Ultra-Wideband Antennas (1) 10. Reflector Antennas (1) 11. Corrugated Horns (1) 12. Antenna Measurements (1) 13. Review (2) 14. Midterm Test (1)

Prescribed text(s):	1. C.A. Balanis, Antenna Theory: Analysis and Design, 2nd or 3rd Ed., J. Wiley & Sons, 1997 or 2005. 2. W.L. Strutzman and G.A. Thiele, Antenna Theory and Design, 2nd Ed., J. Wiley & Sons, 1998.

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**ELEC 454 Microwave Engineering**

Calendar reference:*	Page 277 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Circuit theory for waveguiding systems, scattering parameters, waveguide discontinuities, couplers, resonators, microwave filters, nonreciprocal devices, design of active microwave circuits. Prerequisites: 404 and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	19.6	24.0

Professor-in-charge:	Dr. Poman So
Other instructors:	N/A
Teaching assistants: (number/total hours)	1/45

Major topics:	1. Circuit theory for wave guiding systems (9 lectures) 2. Non-linear circuits (6 lectures) 3. Passive microwave components and matching networks (3 lectures) 4. Microwave amplifier design (15 lectures) 5. Microwave oscillator design (3 lectures)

Prescribed text(s):	1. Microwave Engineering by D. Pozar, 3rd Edition, John Wiley & Sons, 2005 2. Laboratory Manual for ELEC 454 Microwave Engineering – Design and Realization of a Two-Stage, Low-Noise Microstrip Transistor Amplifier by W.J.R. Hoefer and S. Willke, University of Victoria. Fourth Revision, 2007, (Poman So and F. Afshinmanesh). 3. Supplementary text: Microwave Transistor Amplifiers – Analysis and Design by G. Gonzales, Prentice-Hall, 1984 4. Supplementary text: Microwave Circuit Design Using Linear and Nonlinear Techniques by G.D. Vendelin, A.M. Pavio, U.L. Rohde, John Wiley & Sons, 1990 5. Supplementary text: Microwave Circuit Analysis and Amplifier Design by S.Y. Liao, Prentice-Hall, 1987

Laboratory experience:	a)	Introductory tutorial: Specifications and first approximate design
	b)	Experiment 1 – First-order computer analysis with Touchstone™
	c)	Experiment 2 – Design of bias network and computer analysis using microstrip models
	d)	Experiment 3 – Optimized amplifier design and layout for manufacturing
	e)	Experiment 4 – Testing and measurement of amplifier performance
	f)	Hands-on experience in ADS and CST microwave studio

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 456 Mobile Communications**

Calendar reference and course description:*	Page 277 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0 Fading and shadowing, noise and interference effects; source coding, modulation, error control coding, spread spectrum and multiplexing techniques for mobile communications; capacity estimation and comparative (FDMA/TDMA/CDMA) analysis of PCN and cellular systems; capacity estimation for wireless PABX and LAN systems. Prerequisites: 350 and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
			X	X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	22.5	15.0

Professor-in-charge:	Dr. Hong-Chuan Yang
Other instructors:	N/A
Teaching assistants: (number/total hours)	N/A

Major topics:	1. Introduction to wireless communications 2. Wireless channel models: path loss, shadowing, and multipath fading 3. Digital modulation techniques and their performance over fading channels 4. Fading mitigation techniques: diversity and multicarrier transmission 5. Spread spectrum and multiple access 6. Cellular concept and selected advanced topics.

Prescribed text(s):	1. Wireless Communications by A. Goldsmith, Cambridge, 2005

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**ELEC 459 Digital Signal Processing: III**

Calendar reference and course description:*	Page 277 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Decimation and interpolation of discrete signals. Least-squares signal modeling. The LMS algorithm and applications in adaptive interference and system identification. Basic multirate DSP systems. Polyphase representation and design of multirate systems. Application of multirate systems in signal compression and noise removal. Representation and digital processing of speech signals. Neural networks and applications. Prerequisites: 407 and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
			X	X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	10.9	0	0	15.2	17.4

Professor-in-charge:	Dr. Wu-Sheng Lu
Other instructors:	Ms. Ana-Maria Sevcenco
Teaching assistants: (number/total hours)	1/60

Major topics:	1. Introduction (1 lecture) 2. Sampling and aliasing (4 lectures) 3. Analysis of discrete signals (4 lectures) 4. Digital filters and filter banks (8 lectures) 5. Signal interpolation (7 lectures) 6. De-noising and compression of digital signals (6 lectures) 7. Adaptive filtering (7 lectures)

Prescribed text(s):	1. Class Notes for ELEC 459 Digital Signal Processing: III by W.-S. Lu, University of Victoria, revised October 2008. 2. Laboratory Manual for ELEC 459 Digital Signal Processing: III by W.-S. Lu, University of Victoria, revised November 2008.

Laboratory experience:	a) Experiment 1 – Application of DFT in Signal Detection and Interpolation b) Experiment 2 – Application of 2-D DCT to Image Compression c) Experiment 3 – Two-dimensional Digital Filtering for Edge Detection d) Experiment 4 – Identification of Discrete-Time Systems by Adaptive Filtering

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 460 Control Theory and Systems: II**

Calendar reference and course description:*	Page 277 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0 Sampling in control systems. The z-transform and responses between sampling instants. Analysis of sampled data systems and stability testing. State-space analysis and design of continuous and discrete systems. Controllability, observability and zero input stability analysis. Pole placement techniques. Prerequisites: 360 or MECH 435, and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	22.5	15.0

Professor-in-charge:	Dr. Pan Agathoklis
Other instructors:	N/A
Teaching assistants: (number/total hours)	N/A

Major topics:	1. Review of the z transform (2 lectures) 2. Analysis of sampled signals (3 lectures) 3. Analysis of the response of sampled-data control systems (5 lectures) 4. Design and implementation of digital controllers (8 lectures) 5. State-space description of discrete and continuous systems (6 lectures) 6. Stability (1 lecture) 7. Observability and controllability (2 lectures) 8. Design of state-feedback controllers and state observers using pole placement (9 lectures)

Prescribed text(s):	Discrete Time Control Systems by K. Ogata, Prentice-Hall, second edition, 1995

Laboratory experience:	Two laboratory demonstrations of • identifying the system parameters of a simple position control system • designing a digital lead-lag compensator using matlab and implementing it using a microcontroller • designing a digital state-feedback controller using matlab and implementing it using a microcontroller

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**ELEC 466 System-on-Chip Engineering for Signal Processing**

Calendar reference and course description:*	Page 277 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1.5 Design and System-on-Chip (SOC) implementation for signal processing applications. SOC design and testing methodologies, Platform-based design, Intellectual Property (IP) reuse, and built-in self-test. Controlling power consumption in SOC implementations. SOC multi-technology integration of analog and digital electronics, sensors and MEMS. Prerequisites: CENG 355 or MECH 405 or CSC 355; ELEC 310 or MECH 435 and MECH 455, and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU):	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	13.1	30.5

Professor-in-charge:	Dr. Daler N. Rakhmatov
Other instructors:	N/A
Teaching assistants: (number/total hours)	1/45

Major topics:	1. SOC technology: Technology roadmap, design examples, key issues (3 lecture hours). 2. SOC modeling: SystemC language, transaction-level modeling, verification (6 lecture hours) 3. SOC design: Specify-Explore-Refine, platform-based design, IP core reuse (6 lecture hours). 4. SOC test: Design for testability, built-in self-test (6 lecture hours). 5. SOC power: SOC energy consumption and management (6 lecture hours). 6. SOC architectures: IP core interfacing, buses, network-on-chip (6 lecture hours). 7. Advanced topics: MEMS, fabrication, packaging (3 lecture hours).

Prescribed text(s):	1. ELEC 466 lecture notes.

Laboratory experience:	Project – SystemC modeling of mixed HW/SW implementation of Diffie-Hellman key exchange protocol.

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 481 Analog VLSI Systems**

Calendar reference and description:*	Page 277 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0 Review of IC technologies, device models and design concepts. Design of monolithic op amps, regulators, multipliers, oscillators, PLLs, A/D and D/A converters and other nonlinear and high speed ICs. Study and design of integrated filters, switched capacitor circuits, CCDs and other sampled-data circuits. Design and applications of analog neural networks and other analog-digital LSI. Prerequisites: 320 and 380, and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	9.4	28.2

Professor-in-charge:	Dr. Harry H.L. Kwok
Other instructors:	N/A
Teaching assistants: (number/total hours)	N/A

Major topics:	1. Review of device characteristics (3 lectures) 2. Active circuits and basic gain stages (3 lectures) 3. Amplifier circuits (6 lectures) 4. Multipliers and modulators (6 lectures) 5. Communications circuits (6 lecture) 6. Signal processing circuits (6 lectures) 7. Data conversion circuits (6 lectures)

Prescribed text(s):	1. Class Notes for ELEC 481 Analog VLSI Systems: by H. Kwok, University of Victoria, 2008 2. Bipolar and MOS Analog IC Design, A.B. Grebene, Wiley & Sons, 2003

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**ELEC 482 Electrical Drive Systems**

Calendar reference and course description:*	Page 277 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0 Elements of drive systems, characterization of mechanical loads, requirements of electrical drive systems, dynamic equations and modelling of electrical machines, dc drives with various dc power sources, induction motor drives, ac controller, slip-energy recovery, constant air-gap flux, synchronous motor drives, permanent magnet motors, reluctance motors. Prerequisites: 365 or 370, and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	18.8	18.8

Professor-in-charge:	Dr. Subhasis Nandi
Other instructors:	Mr. Ilamparithi Thirumarai Chelvan
Teaching assistants: (number/total hours)	N/A

Major topics:	1. Review of basic power electronics (5 lectures) 2. Characterization of mechanical loads and stability of operating point (2 lectures) 3. Review of DC motor speed control (1 lecture) 4. Steady state and transient modelling of DC motors (2 lectures) 5. Chopper drives (5 lectures) 6. Controlled-rectifier drives (4 lectures) 7. Multi-quadrant drives (2 lectures) 8. Review of AC motors (2 lectures) 9. Modelling of AC motors (1 lecture) 10. Brief descriptions of various speed control schemes (1 lecture) 11. Speed control by slip-energy recovery (1 lecture) 12. Speed control by using constant and variable V/F methods (5 lectures) 13. Voltage source and current source inverter drives (5 lectures)

Prescribed text(s):	1. Fundamentals Of Electrical Drives 2e, by Gopal K. Dubey, Alpha Science International Edition, 2001.

Laboratory experience:	a) Demo – Chopper-fed separately-excited DC motor drive. b) Demo – V/F controlled induction motor drive using a commercial inverter

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**ELEC 483 Digital Video Processing: Algorithms and Applications in Media**

Calendar reference and course description:*	Page 277 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0 Representation of digital video. Image formation models. Spatio-temporal sampling and sampling structure conversion. Two- and three-dimensional motion estimation techniques. Optical flow, block-based and pel-recursive methods for motion estimation. Still image and video compression methods and standards. Interframe compression and model-based methods for video compression. Digital video systems and applications. Prerequisites: 310 and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU):	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	22.5	15.0

Professor-in-charge:	Dr. Pan Agathoklis
Other instructors:	N/A
Teaching assistants: (number/total hours)	N/A

Major topics:	1. Review of multidimensional Fourier and z-Transforms (3 lectures) 2. Video formation and representation in space-time and frequency domains. The Human Visual System and video perception. (6 lectures) 3. Video Sampling and Sampling rate conversion (11 lectures) 4. Two-dimensional motion estimation (6 lectures) 5. Foundations of Video coding (5 lectures) 6. Video Compression standards and applications (5 lectures)

Prescribed text(s):	Video Processing and Communications by Y. Wang, J. Ostermann and Y-Q. Zang, Prentice-Hall, 2002

Laboratory experience:	The course includes matlab assignments and a major project. Students are expected to: • formulate a project proposal by the middle of the term, • make a presentation of their results during the last class and • submit a final report outlining the problem considered, methodology and discussion of the results.

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**ELEC 484 Audio Signal Processing**

Calendar reference and course description:*	Page 277 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0 Fundamentals: A/D, oversampling converters, jitter, dither, spectral analysis. Formats: CD, DVD, SACD. Perceptual coding: MP3, AAC. Sound synthesis: modal, additive, subband vocoder, subtractive, LPC, non-linear, FM, physical modelling, granular. Spatial audio, surround sound. Noise reduction. Systems and applications. Prerequisities: 310 and fourth-year standing

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	18.8	18.8

Professor-in-charge:	Dr. Peter Driessen
Other instructors:	Dr. George Tzanetakis
Teaching assistants: (number/total hours)	N/A

Major topics:	1. Digital signal processing review and intro to audio effects 2. Filters (parametric, shelving, time-varying) 3. Delay structures, delay-based audio effects 4. Modulators and demodulators 5. Dynamics processing, non-linear processing 6. Spatial effects, 3-D audio, reverberation 7. Time segment processing, pitch shifting, time stretching 8. Time-frequency processing, phase vocoder

Prescribed text(s):	1. DAFX Digital Audio Effects by U. Zolzer, Wiley, 2002

Laboratory experience:	No formal laboratory, but extensive Matlab-based assignments, and one hour visit to computer music studios

*Explanatory notes on inconsistencies with calendar information (if applicable):

Some topics in calendar description are reserved for the sequel (graduate) course

Course number and title:	**ELEC 496 Selected Topics in Electrical Engineering: Fundamentals of Hybrid Electric Vehicles - Technology Advance, Modeling, Simulation and Design (Fall)**

Calendar reference and description:*	Page 278 of the 2008-2009 University of Victoria Undergraduate Calendar ELEC 496 Selected Topics in Electrical Engineering Units: 1.5, Hours: 3-0 Note: May be taken more than once for credit in different topics to a maximum of 3 units with permission of the Chair of the Department. Prerequisites: The student must be registered in term 4A or 4B.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	9.4	28.2

Professor-in-charge:	Dr. Kin Fun Li
Other instructors:	Dr. Zuomin Dong
Teaching assistants: (number/total hours)	1/39

Major topics:	BACKGROUND AND RELATED TECHNOLOGIES 1. Development of Vehicle Technology (0.5 wk) 2. Overview of Hybrid Electric Vehicles (1.5 wk) 3. Generic Vehicle Models (1 wk) 4. Powerplant of HEV (0.5 wk) 5. Electric Propulsion Systems (0.5 wk) 6. Transmission (1.5 wk) 7. Other Key Powertrain Issues (1 wk) 8. Onboard Energy Storage System and Recent Development (1 wk) MODELING, SIMULATION AND DESIGN OPTIMIZATION 9. General Background (0.5 wk) 10. MatLab and Simulink (0.5 wk) 11. ADVISOR - ADvanced Vehicle SimulatOR from NREL (0.25 wk) 12. PSAT - Powertrain System Analysis Toolkit from Argonne NL (1.5 wk) 13. SimDriveline™ & SimPower™ - MathWorks-Simulink Based Mechanical Driveline and Electrical Power Systems Modeling Tools (0.5 wk) 14. Dymola - Dynamic Modeling Laboratory (0.25 wk) 15. Study/ Design of Innovative Hybrid Powertrain Architecture (2 wks) 16. Design Optimization Tools (0.25 wk) 17. Vehicle Powertrain Design Optimization (0.5 wk) Other Issues in HEV Design and Developments (0.5 wk)

Prescribed text(s):	Lecture notes, tutorials and technical papers posted at the course website: http://www.me.uvic.ca/~mech450e/

Laboratory experience:	Tutorials (12 hours) • Modeling of Multiphysics System Using MATLAB Simulink and Stateflow • Modeling of Hybrid Electric Vehicle using PSAT (Powertrain System Analysis Toolkit) Practice of lecture/tutorial materials is carried out by groups in informal gathering HEV Preliminary Design Midterm Project and Presentation HEV Architecture Design Final Project and Presentation

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 496 Selected Topics in Electrical Engineering: Life Cycle and Environment Impact Analysis of Lithium-ion Batteries for EV and PHEV (Summer)**

Calendar reference and description:*	Page 278 of the 2008-2009 University of Victoria Undergraduate Calendar ELEC 496 Selected Topics in Electrical Engineering Units: 1.5, Hours: 3-0 Note: May be taken more than once for credit in different topics to a maximum of 3 units with permission of the Chair of the Department. Prerequisites: The student must be registered in term 4A or 4B.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	9.4	28.2

Professor-in-charge:	Dr. Kin Fun Li
Other instructors:	Dr. Zuomin Dong
Teaching assistants: (number/total hours)	N/A

Major topics:	• review the developments and trends of leading edge lithium-ion battery technologies and products (3 wks)
	• examine the current and future impacts from the mass production of lithium-based rechargeable batteries to the advance of EV, HEV and PHEV vehicles, emission reduction, and environment (3 wks)
	• key issues related to the wide use of lithium-based rechargeable batteries (5 wks)
	  o the raw material supply (1wk)
	  o mass production capability (1wk)
	  o recycling program(1wk)
	  o production process (1wk)
	  o resulting environment impacts (1wk)
	• Concept designs of low environment impact lithium-ion battery packs with life cycle and environment impact analysis (2 wks)

Prescribed text(s):	References: • Dr. Dong's research notes • Open literature

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**ELEC 499 Design Project (Spring)**

Calendar reference and course description:*	Page 278 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours 0-6 A significant technical design project in Electrical Engineering completed under the supervision of a faculty member. This design experience is based on the knowledge and skills acquired in earlier course work. Projects may originate from faculty members, students, or external sources. They may have a diverse nature and serve diverse needs. Multi-disciplinary projects are encouraged. Prerequisites: Fourth-year standing in the Electrical Engineering Program or permission of the Department

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU):	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	0	66.5

Professor-in-charge:	Dr. Adam Zielinski
Other instructors:	Dr. Kin Fun Li, Dr. Issa Traoré
Teaching assistants: (number/total hours)	1/52

Major topics: (sample of projects)	1. Driver-Intent Collision Evasion System 2. Advanced Roomba Navigation Systems 3. Local Positioning 4. Personal Trainer for Smartphone 5. RC Car Tilt Screen Controller 6. Closed captioning eyewear device 7. One Laptop per Grandparent 8. USB Based Engineering Instrumentation 9. FPGA-Based Vocoder 10. EMG Emulator 11. Home Domotics 12. Automatic Stereo Equalization 13. Electric Power Consumption Monitor 14. A Study on Multi-regime HEV Additional Electric Drive System 15. One Laptop per Grandparent: Email is for Everyone

Prescribed text(s):	Related to the project

Laboratory experience:	As required by the specific project

*Explanatory notes on inconsistencies with calendar information (if applicable):

Weekly scheduled meetings with Professor-in-charge. Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ELEC 499 Design Project (Summer)**

Calendar reference and course description:*	Page 278 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 0-6 A significant technical design project in Electrical Engineering completed under the supervision of a faculty member. This design experience is based on the knowledge and skills acquired in earlier course work. Projects may originate from faculty members, students, or external sources. They may have a diverse nature and serve diverse needs. Multi-disciplinary projects are encouraged. Prerequisites: Fourth-year standing in the Electrical Engineering Program or permission of the Department

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU):	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	0	66.5

Professor-in-charge:	Dr. Adam Zielinki
Other instructors:	Dr. Kin Fun Li, Dr. Issa Traoré
Teaching assistants: (number/total hours)	1/52

Major topics: (sample of projects)	1. Surround sound impulse response 2. Bluetooth Practice Golf Ball 3. TP4 Driving Habit Recorder 4. RFID Prescription Drug Reminder System 5. Real-time Indoor Navigation System for Mobile Devices

Prescribed text(s):	Related to the project.

Laboratory experience:	As required by the specific project.

*Explanatory notes on inconsistencies with calendar information (if applicable):

Weekly scheduled meetings with Professor-in-charge. Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**ENGL 115** University Writing

Calendar reference:*	**ENGL 115** Units: **1.5** Hours: **3-0** **University Writing** Writing, research, and organizational skills appropriate for university-level writing. Written assignments designed to improve the student's ability to write clearly and correctly, to organize material, and to carry out basic library research. Note: Those who score level 5 on LPI may not take this course. Prerequisites: A score of level 4 on LPI. Page 278 of the 2008-2009 University of Victoria Undergraduate Calendar.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU): **37.56**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
			37.6 (100%)		

Professor-in-charge:	Joseph Gibson, PHD Continuing Sessional Lecturer
Other instructors:	N/A
Teaching assistants: (number/total hours)	N/A

Major topics:	Weeks 1-2 Diagnostic essay writing and quizzes to assess section writing level. Weeks 3 Reading skills development; in-class essay, does not count. Week 4 Grammar and essay format: in-class essay, counts. Week 5 APA format and APA formal essay topics; detailed thesis development class. Week 6 Detailed structure and grammar class; second in-class essay Week 7 Office hour class and APA format detailing; APA essay due. Week 8 Reading Break Week 9 MLA topics and format; third in-class essay. Week 10 MLA format detailing and office-hour class with individual students Week 11 Grammar class; MLA essay due. Week 12 Last in-class essay; last class with exam preparation. Final exam 3 hours long in exam period.

Prescribed text(s):	MacRae, Paul, et.al. *The University of Victoria Writer's Guide*, 3rd custom ed. Boston: Pearson Custom Publishing, 2009.

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course number and title:	ENGL 135 – Academic Reading and Writing

Calendar reference:*	**ENGL 135** Units: **1.5** Hours: **3-0** Academic Reading and Writing Practice of skills needed for successful academic writing in a variety of subject areas. Analysis of rhetorical, stylistic, research and documentation techniques; development of these techniques through practical writing assignments. Balance of lectures and discussion. Prerequisites: English 12 class grad, qualifying score on LPI or 1.5 units of English. Page 278 of the 2008-2009 University of Victoria Undergraduate Calendar.

CEAB course type: (indicate with X)	Common core	Program compulsory	Option compulsory	Program elective	Other
	X				

CEAB curriculum category content (number of AU):	Math	Natural science	Complementary studies	Engineering science	Engineering design
37.56 (100%)			37.6 (100%)		

Professor-in-charge:	Eric Henderson, PhD Sessional Lecturer, Department of English
Other instructors:	
Teaching assistants: (number/total hours)	

Major topics:	Week 1 Orientation: Class orientation/Moodle/Academic Reading: General Features of Academic Writing Week 2 Academic Reading: Conventions of Academic Writing/Keys for Reading Challenging Essays/What's the story, Mother? Week 3 Academic Reading: Soc Sc & Sciences: ATRZ: To Die For/Review: The Essay: The Essay: An Introduction; Essay Structure Week 4 Review: The Essay: An Introduction to Research; Writing Summaries/Academic Writing: Research Proposals Week 5 Academic Writing: Review: Grammar: sentence errors, punctuation, apostrophes, sentence errors, etc. Week 6 Grammar test/Academic Writing: Annotated Bibliographies Week 7 Reading Break Week 8 Academic Writing: Using Outlines/An Introduction to Research/peer edit Week 9 Academic Writing: Documenting Your Sources/peer edit Week 10 Argument: Writing Argumentative Essays/research essay and annotated bibliography due/Giving life to Logic Week 11 On Classrooms/Review Grammar: agreement, pronouns, modifiers errors, parallelism/Electronic Classroom Week 12 Review Grammar Week 13 Argument: peer edit/argumentative essay due

Prescribed text(s):	Henderson, Eric. *Course Readings Fall Session 2008*. MacRae, Paul, et.al. *The University of Victoria Writer's Guide*, 3rd custom ed. Boston: Pearson Custom Publishing, 2009.

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course number and title:	**ENGR 001 – Work Term 1**

Calendar reference:*	**Engr 001** Units: **2.0** Work Term 1 Co-operative education enhances students' intellectual, professional and personal development by providing opportunities for applying academic theories and knowledge, evaluating and adjusting career directions and developing confidence and skills in working with people. As an integral component of Co-operative Education Programs, students are employed for a work term, normally of four months' duration. Competencies typically addressed during the first work term include personal management and work place behavior. The first work term will provide an introduction to a productive work experience that is related to the student's program of studies and individual interests. Prerequisites: Engr020 and approval of Faculty

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
227.5					

Professor-in-charge:	
Other instructors:	Co-op Coordinator
Teaching assistants: (number/total hours)	

Major topics:	Core Competencies: Personal Management, Workplace Behaviour Personal Management *Recognizes impact on others and demonstrates adaptability to and management of change* • Acts with honesty, integrity and personal ethics • Recognizes personal efforts and the efforts of others • Acknowledges diverse opinions and accept differences • Manages personal health and emotional well being • Takes responsibility and demonstrates resiliency and accountability for self • Plans and manages personal time, finances and other resources • Assesses, weighs and manages risk in the face of uncertainty • Recognizes strengths and areas for improvement • Adapts to new environments and cultures Workplace Behavior *Meets or exceeds workplace guidelines, standards and specifications* • Follows workplace policies (e.g. health and safety, equity, confidentiality, harassment) • Recognizes rights and responsibilities in relation to workplace practices and policies • Follows current government legislation related to workplace policies/procedures • Takes responsibility to understand workplace culture • Abides by standards of practice relevant to chosen profession

Prescribed text(s):	

Laboratory experience:	

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course Description as submitted for the 2010/2011 academic calendar. Submission approved by the Faculty of Engineering on November 4, 2009.

Course number and title:	ENGR 002 – Work Term 2

Calendar reference:*	**Engr 002** Units: **2.0** Work Term 2 As an integral component of Co-operative Education Programs, students are employed for a work term, normally of four months' duration. Competencies typically addressed during the second work term include communication and teamwork. The second work term should generally provide an increased level of responsibility in an area that is related to the student's program of studies and individual interests. Prerequisites: Engr001, Engr240, and approval of Faculty

CEAB course type: (indicate with X)	Common core	Program compulsory	Option compulsory	Program elective	Other
	X				

CEAB curriculum category content (number of AU):	Math	Natural science	Complementary studies	Engineering science	Engineering design
227.5					

Professor-in-charge:	Co-op Coordinator
Other instructors:	
Teaching assistants: (number/total hours)	

Major topics:	Core Competencies: Communication, Teamwork Communication *Uses communication styles and methods effective for the situation and audience* • Communicates in a tone and manner that demonstrates respect • Demonstrates active listening skills and effective interpersonal communication • Writes clearly and accurately in a variety of contexts and formats • Listens and asks questions to understand others viewpoints • Communicates issues in a timely manner • Demonstrates awareness of and responsiveness to verbal and non-verbal communication styles • Recognizes cultural differences with respect to communication • Utilizes effective cross-cultural communication skills Teamwork *Works co-operatively within diverse teams to achieve collective goals* • Works within the dynamics of a group • Demonstrates commitment to the team's purpose and objectives • Accepts and provides feedback in a constructive and considerate manner • Shares information and encourages others to do the same • Supports and motivates group(s) for high performance • Recognizes the role of conflict in a group to reach solutions • Manages and resolves conflict when appropriate • Builds professional relationships • Demonstrates accountability to team's purpose and follows through on commitments • Works effectively within a variety of situations, and with various individuals or groups • Considers diverse perspectives and working styles within a cross-cultural context

Prescribed text(s):	

Laboratory experience:	

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course Description as submitted for the 2010/2011 academic calendar. Submission approved by the Faculty of Engineering on November 4, 2009.

Course number and title:	**ENGR 003 – Work Term 3**

Calendar reference:*	**Engr 003** Units: **2.0** Work Term 3 As an integral component of Co-operative Education Programs, students are employed for a work term, normally of four months' duration. Competencies typically addressed during the third work term include managing information, research and problem solving, and commitment to quality. The third work term should generally provide an increased level of responsibility in an area that is related to the area of specialization in the student's program of studies. Prerequisites: Engr002, Engr240, and approval of Faculty

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
227.5					

Professor-in-charge:	Co-op Coordinator
Other instructors:	
Teaching assistants: (number/total hours)	

Major topics:	Core Competencies: Managing Information, Research and Problem Solving, Commitment to Quality Managing Information *Recognizes the need for information gathering and/or identifies and clarifies the questions that need to be answered* • Researches and interprets relevant information from a range of sources • Reviews, retains and applies ideas • Evaluates the validity and bias of information • Utilizes the data gathered to draw conclusions or to create new sources of information that can be shared with others • Documents sources of information • Uses appropriate technologies to acquire and process information Research and Problem Solving *Uses information from a variety of sources, including personal experience and observation to guide opinion and solve problems* • Recognizes the human, interpersonal and technical dimensions of a problem • Accesses, analyzes and applies knowledge and skills from various disciplines • Thinks critically and strategically • Applies knowledge, skills and lessons learned from past experiences to new and varied situations • Assesses situations and identifies problems • Explores possible solutions in an innovative and creative way • Evaluates solutions to make recommendations or decisions Commitment to Quality *Improves work practices to achieve desired results* • Seeks opportunities to improve work practices • Generates ideas for improvement • Pays attention to the quality of his/her work • Persists when difficulties arise • Tries innovative ways to get things done • Considers situations from new perspectives • Evaluates work results to determine effectiveness • Maintains quality standards of own work

Prescribed text(s):	

Laboratory experience:	

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course Description as submitted for the 2010/2011 academic calendar. Submission approved by the Faculty of Engineering on November 4, 2009.

Course number and title:	ENGR 004 – Work Term 4

Calendar reference:*	**Engr 004** Units: **2.0** Work Term 4 As an integral component of Co-operative Education Programs, students are employed for a work term, normally of four months' duration. Competencies typically addressed during the fourth work term include project and task management, social responsibility and continuous learning. The fourth work term should generally provide a path to a career choice in the student's anticipated degree. Prerequisites: Engr003, and approval of Faculty

CEAB course type: (indicate with X)	Common core	Program compulsory	Option compulsory	Program elective	Other
	X				

CEAB curriculum category content (number of AU):	Math	Natural science	Complementary studies	Engineering science	Engineering design
227.5					

Professor-in-charge:	Co-op Coordinator
Other instructors:	
Teaching assistants: (number/total hours)	

Major topics:	Core Competencies: Project and Task Management, Social Responsibility and Continuous Learning Project and Task Management *Manages the process and implementation of projects and tasks in a timely and directed manner* • Plans, designs or carries out projects or tasks with well-defined objectives and outcomes • Determines appropriate implementation strategies, tools and technologies • Adapts to changing work priorities and workplace practices • Uses a range of assessment techniques to monitor the success of a project or task • Establishes priorities to meet deadlines • Carries out multiple tasks or projects Social Responsibility *Recognizes how beliefs and actions fit within the context of a greater community* • Identifies personal convictions and explores options for putting these convictions into practice • Accepts responsibility for own actions • Evaluates ethical aspects of decision making • Demonstrates respect for a diversity of ideas and the rights of others • Exhibits personal, professional, and academic honesty • Chooses ethical courses of action • Participates in activities that contribute to the local, national or international community • Builds equitable relationships • Acts responsibly in accordance with principles of sustainability • Considers global implications when making decisions Continuous Learning *Uses effective learning techniques to acquire and apply new knowledge and skills.* • Sets, articulates and pursues personal and educational goals • Identifies and accesses learning sources and opportunities • Demonstrates willingness to continuously learn and grow • Assesses personal strengths and seeks areas for development • Learns from mistakes and successes • Seeks feedback from others and positively accepts constructive feedback • Stays current with techniques and technologies in own field

Prescribed text(s):	

Laboratory experience:	

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course Description as submitted for the 2010/2011 academic calendar. Submission approved by the Faculty of Engineering on November 4, 2009.

Course number and title:	**ENGR 020 - Introduction to Professional Practice**

Calendar reference:*	**ENGR 020** Units: **0** Hours: **1-0** **Introduction to Professional Practice** Awareness of the role and responsibilities of Professional Engineers in society with respect to the environment, ethics, equity, public and worker safety and health considerations. Introduction to technical and other forms of work term and/or experience report preparation, understanding national and international placement standards, WCB standards, engineering logbooks. Development of effective interview techniques, skill assessment and analysis, career management and development. Preparation or resumes and cover letter. Page 284 of the 2008-2009 University of Victoria Undergraduate Calendar

CEAB course type: (indicate with X)	Common core	Program compulsory	Option compulsory	Program elective	Other
	X				

CEAB curriculum category content (number of AU):	Math	Natural science	Complementary studies	Engineering science	Engineering design
12.52			12.5 (100%)		

Professor-in-charge:	Megan Jameson
Other instructors:	Cindy Lowe
Teaching assistants: (number/total hours)	N/A

Major topics:	Week 1 Co-op as a Learning Model/Skills Assessment – Worksheet/Writing a technical resume. Week 2 Writing a professional covering letter/Interview skills Week 3 The Placement process/Work Term Requirements/An Employer's Perspective on Professionalism/Ethics and Sustainability – Guest Speaker Week 4 Portfolios/Networking/Final Quiz.

Prescribed text(s):	N/A

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**ENGR 240 – Technical Writing**

Calendar reference:*	**ENGR 240** Units: **1.5** Hours: **3-0** Technical Writing Searching and referencing methods used in dealing with scientific and technical literature and on the characteristics of effective technical and scientific style. The emphasis throughout will be on clarity, precision, and consistency. Students will acquire practical experience in the writing of short technical documents such as memoranda, letters and abstracts, longer forms such as reports, papers, and theses, and instructional forms such as manuals,brochures, and specifications. **Note:** Credit will be granted for only one of 240, ENGL 225, ENGL 226, ENGL 240. Prerequisites: ENGL 115 or 135 or ENGR 110 or 111. Page 284 of the 2009-2010 University of Victoria Undergraduate Calendar.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
37.56			37.6 (100%)		

Professor-in-charge:	Suzan Last Sessional Instructor, Department of English
Other instructors:	Kathryn Curtis
Teaching assistants: (number/total hours)	N/A

Major topics:	Week 1 Introduction; Basics of Professional Writing Week 2 Business Communications (letters, memos) (Chapter 12) Week 3 Giving Presentations (Chapter 15) Week 4 Writing Proposals; Audience and Task Analysis (Chapter 17) Week 5 Vet Proposals, Choose Team Projects; Managing Team Projects (Chapter 20); Formal Reports (Chapter 4) Week 6 Editing and Revising, Process Reports (Chapter 2) Week 7 Document Design: Headings, Lists, Tables, Graphics (Chapters 7, 8, 10, 11) Week 8 Engineering Research (Chapter 18, 19); Library Workshop Week 9 Progress Reports; Persuasion (Chapter 6) Week 10 Reading Break Week 11 Grammar Review Week 12 Review Formal Reports Specifications Week 13-14 Team Presentations

Prescribed text(s):	McMurrey, David, et. al. *Power Tools for Technical Comunications, 1st Canadian ed.* Thomson, 2007.

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**ENGR 280** **Engineering Economics**

Calendar reference:*	**ENGR 280** Units: **1.5** Hours: **3-0** **Engineering Economics** Macroeconomics principles: money, interest rates, growth. Microeconomic principles: demand and supply, production, consumer utility nd elasticity. Net present value, equivalence, rate of return. Public vs. private sector cost-benefit analysis, externalities, risk and uncertainty, industry and innovation life cycles. **Prerequisites:** MATH 133 or 233A **Pre or corequisites:** STAT 254 or 260 Page 284 of the 2008-2009 University of Victoria Undergraduate Calendar.

CEAB course type: (indicate with X)	Common core	Program compulsory	Option compulsory	Program elective	Other
	X				

CEAB curriculum category content (number of AU):	Math	Natural science	Complementary studies	Engineering science	Engineering design
37.56			37.6 (100%)		

Professor-in-charge:	Kam So
Other instructors:	Omer Khan
Teaching assistants: (number/total hours)	2/5 per week

Major topics:	**Week 1 Engineering Decision Making** **Week 2 Time Value of Money** **Week 3 Combining Factors** **Week 4 Nominal and Effective Interest Rates** **Week 5 Present Worth Analysis** **Week 6 Annual Worth Analysis** **Week 7 Rate of Return Analysis (Single Alternatives)** **Week 8 Rate of Return Analysis (Multiple Alternatives)** **Week 9 Cost Benefit Analysis and Public Sector Economics** **Week 10 Sensitivity Analysis**

Prescribed text(s):	Blank, Tarquin, Iverson. *Engineering Economics in Canada 3rd Edition*, 2008.

Laboratory experience:	

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course number and title:	**ENGR 297 Technology and Society**

Calendar reference:*	**ENGR 297** Units: **1.5** Hours: **3-0** **Technology and Society** This course introduces the student to the effects of technology on society. The ethical, environmental, cultural, social, economic and political issues raised by technological change will be emphasized. The concepts of sustainable development and environmental stewardship will be discussed. **Pre or corequisites:** ENGR 240 or ENGL 225 or 240 Page 285 of the 2008-2009 University of Victoria Undergraduate Calendar.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
37.56			37.6 (100%)		

Professor-in-charge:	Scott Miller Sessional Lecturer, Computer Science
Other instructors:	N/A
Teaching assistants: (number/total hours)	N/A

Major topics:	**Week 1 Introduction to Issues in Technology and Society** **Week 2 Critical Thinking and Causality** **Week 3 Causal Loop Analysis** **Week 4-5 Environments that Stimulate Technological Advances and Entrepreneurial Activities, Technology and Economic Development** **Week 6 Engineering Ethics, Ethical Issues in Technology and Society** **Week 7 Sustainability Issues and Eco-engineering** **Week 8 Culture of Technology** **Week 9 Reliability and Safety Engineering Issues** **Week 10 Sensitivity, Scenario Analysis and Simulation** **Week 11 Decision Theory for Analyzing Technology and Society Issues** **Week 12-13 Utility Theory, Indifference Curves and Game Theory**

Prescribed text(s):	"Technology and Society: A Canadian Perspective", J. Goyder, 2nd ed., 1997.

Laboratory experience:	

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course number and title:	**ENGR 446** – Technical Report

Calendar reference:*	**ENGR 446** Units: **1.0** **Technical Report** A major technical report demonstrating written communication and analytical skills. The report topic must be approved by the Engineering and Computer Science/Math Co-op Program Manager at least two months prior to submission. Work Term Report Guidelines in effect at the time of registration govern report style and format. Students normally register in the course in the term preceding the final term of their program (academic or work term) and the report must be submitted to the Engineering and Computer Science/Math Co-op Office by the first Friday of the next term. **Prerequisites:** 240 Page 285 of the 2008-2009 University of Victoria Undergraduate Calendar.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU):	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
29.50			20.7 (70%)	8.9 (30%)	

Professor-in-charge:	Roel Hurkens
Other instructors:	Jonathan Foweraker
Teaching assistants: (number/total hours)	N/A

Major topics:	**N/A**

Prescribed text(s):	N/A

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course number and title:	**Math 100 - Calculus I**

Calendar reference:*	**MATH 100** Units: **1.5** Hours: **3-0-1** **Calculus: I** Review of analytic geometry; functions and graphs; limits; derivatives; techniques and applications of differentiation; antiderivatives; the definite integral and area; logarithmic and exponential functions; trigonometric functions; Newton's, Simpson's and trapezoidal methods. **Notes:** - Credit will be granted for only one of 100, 102. - See notes 1,2,3,and 4 on page 189. **Prerequisites:** Minimum grade of B in one of the Principles of Mathematics 12, Pre-calculus 12, or equivalent; or 120; or a PASS on the MATH 100 pretest. Page 337 of the 2009-2010 University of Victoria Undergraduate Calendar.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
43.6	43.6 (100%)				

Professor-in-charge:	Svetlana Oshkai, M.S.
Other instructors:	Dr. John Phillips, Dr. Jacobus Swarts, Dr. Robert Yuncken, Dr. Edward Moore, Dr. Florin Diacu, Dr. Mak Trifkovic
Teaching assistants: (number/total hours)	9 Teaching Assistants (36 hours each), 9 Markers (36 hours each)

Major topics:	**Weeks 1,2 - Tangent lines, Limit concept, Concept of Continuity,** **Week 3 - Derivative and Rates of Change, Basic Rules of Differentiation,** **Weeks 4, 5 - Chain Rule, Macima and Minima of Functions, Derivatives of Trigonometric, Exponential and Logarithmic Functions,** **Week 6 - Implicit Differentiation and Related Rates, Successive Approximations and Newton's method,** **Weeks 7, 8 - Differentials and Linear Approximation, Increasing and Decreasing Functions, Mean value theorem, First and Second derivative tests, Curve sketching and asymptotes,** **Week 9 - L'Hopital's rule and Indeterminate forms,** **Week 10 - Antiderivatives and Initial value problems, Riemann Sums and Integrals,** **Week 11 - Evaluation of Integrals, Fundamental Theorem of Calculus, Integration by Substitution,** **Week 12 - Areas of Plane Regions, Numerical Integration.**

Prescribed text(s):	"Calculus: Early Transcendentals" by Edwards and Penney, seventh ed.

Laboratory experience:	

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course number and title:	**Math 101 - Calculus II**

Calendar reference:*	**MATH 100** Units: **1.5** Hours: **3-0** **Calculus: II** Volumes; arc length and surface area; techniques of integration with applications; polar coordinates and area; l'Hospital's rule; Taylor's formula; improper integrals; series and tests for convergence; power series and Taylor series; complex numbers. **Note:** See note 4 on page 189. **Prerequisites:** 100 or equivalent. Page 337 of the2008-2009 University of Victoria Undergraduate Calendar.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
37.6	37.6				

Professor-in-charge:	Svetlana Oshkai, M.S.
Other instructors:	Dr. Roderick Edwards, Dr. Chan-Ho Suh, Dr. Edward Moore, Dr. Michele De La Chevrotiere , Dr. Sehjeong Kim
Teaching assistants: (number/total hours)	8 Markers (36 hours each)

Major topics:	**Weeks 1 , 2- Volumes by Methods of Cylindrical shells and Cross Sections, Arc Length, Natural Logarithm as an Integral,** **Week 3 - Inverse Trigonometric Functions, Hyperbolic Functions,** **Week 4 - Integral Tables and Simple Substitutions, Integration by Parts,** **Week 5 - Trigonometric Integrals, Rational Functions and Partial fractions,** **Week 6 - Trigonometric Substitution, Improper Integrals, Simple Equations and Models, Separable Equations,** **Week 7 - Complex numbers, Improper Integrals,** **Weeks 8, 9 - Infinite Sequences and Series, Convergence, Taylor Series and Taylor Polynomials,** **Week 10 - Alternating Series and Absolute Convergence, Power Series,** **Weeks 11, 12 - Polar Coordinates, Area Computations in Polar Coordinates, Parametric curves.**

Prescribed text(s):	“Calculus: Early Transcendentals” by Edwards and Penney, seventh ed.

Laboratory experience:	

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course number and title:	**Math 133 "Matrix Algebra For Engineers"**

Calendar reference:*	**MATH 133** Units: **1.5** Hours: **3-0-1** **Matrix Algebra For Engineers** Complex numbers, matrices and basic matrix operations, vectors, linear equations, determinants, eigenvalues and eigenvectors, linear dependence and independence, orthogonality. **Note:** Credit will be granted for only one of 133, 110, 233A. **Prerequisites:** Admission to BEng or BSENG program. Page 337 of the 2008-2009 University of Victoria Undergraduate Calendar.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
43.6	43.6 (100%)				

Professor-in-charge:	Svetlana Oshkai, M.S.
Other instructors:	Dr. Marcelo Laca
Teaching assistants: (number/total hours)	6 Teaching Assistance (36 hours each), 3 Markers (36 hours each)

Major topics:	**Weeks 1,2 - Complex Numbers, Polar form of Complex numbers, System of Linear equations,** **Week 3 - Gaussian Elimination, Matrices and Matrix operations,** **Week 4 - Inverses, Rules of Matrix Arithmetic, Elementary matrices, Finding Inverse,** **Weeks 5,6 - Diagonal, Triangular and Symmetric matrices, Determinants by Cofactor Expansion and by Row Reduction, Properties of the Determinant Function,** **Week 7 - Euclidean n-space, Linear Transformations,** **Week 8 – Properties of Linear Transformations, Real Vector Spaces, Subspaces,** **Week 9 - Linear Independence, Basis and Dimension,** **Week 10 - Row Space, Column Space and Nullspace, Rank and Nullity,** **Weeks 11, 12 - Eigenvalues and eigenvectors, Diagonalization, General Linear Transformations, Kernel and Range.**

Prescribed text(s):	"*Elementary Linear Algebra",* 9th edition 2005, by Anton and Rorres, J. Wiley

Laboratory experience:	

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course number and title:	**MATH 200 Calculus of Several Variables**

Calendar reference:*	**MATH 200** Units: **1.5** Hours: **3-0-1** Calculus of Several Variables Vectors and vector functions; solid analytic geometry; partial differentiation; directional derivatives and the gradient vector; Lagrange multipliers; multiple integration with applications; cylindrical and spherical coordinates; surface area; line integrals; Green's Theorem. The section of this course for engineering students will also cover the following topics: surface integrals and the divergence theorem. **Note:** Credit will be given for only one of 200, 202, 205. If all of 202, 200, and 201 are taken, credit will be given for only 200 and 201. **Prerequisites:** 101 Page 338 of 2008-2009 University of Victoria Undergraduate Calendar.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU)**:** **43.6**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	43.6 (100%)				

Professor-in-charge:	Dr. Robert Steacy, Senior Instructor, Mathematics and Statistics
Other instructors:	Michele de la Chevrotiere Dr. Ryan Budney
Teaching assistants: (number/total hours)	3/108 (to hold the one hour tutorial each week).

Major topics:	**Precisely as specified in the Calendar entry.**

Prescribed text(s):	Edwards & Penney, *Calculus: Early Transcendentals*, 7th edition

Laboratory experience:	No laboratory, but there is a one-hour tutorial each week. The instructor puts a problem on the board, and encourages the students to break up into groups of five or six to work on the problem collaboratively. Usually, three problems of medium to high difficulty can be done each session.

*Explanatory notes on inconsistencies with calendar information (if applicable):

The Calendar entry refers to “the section of the course for Engineering students”, however, there has not been a separate section for Engineering students for the last several years.

Course number and title:	**MATH 201- Introduction to Differential Equations**

Calendar reference:*	**MATH 201** Units: **1.5** Hours: **3-0-1** Introduction to Differential Equations First order equations; linear second order equations and 2-dimensional systems of linear equations with constant coefficients; elementary qualitative methods; numerical Euler and Runge-Kutta methods; Laplace transform; applications to the physical, biological and social sciences. **Note:** Credit will be given for only one of 201,202. If all of 202, 200, and 201 are taken, credit will be given for only 200 and 201. **Prerequisites:** 101. Pg 338 of the 2008-2009 University of Victoria Undergraduate Calendar

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
43.6	30.5 (70%)	13.1 (30%)			

Professor-in-charge:	Dr. Robert Steacy, Senior Instructor, Mathematics and Statistics
Other instructors:	
Teaching assistants: (number/total hours)	3/108 (to hold the one hour weekly tutorial).

Major topics:	As specified in the course outline, but with the addition of the two topics mentioned below in "explanatory notes on inconsistencies with Calendar information".

Prescribed text(s):	Zill, Dennis G., A First Course in Differential Equations with Modeling Applications, 9th edition.

Laboratory experience:	No laboratory, but there is a one-hour tutorial each week. The instructor puts a problem on the board, and encourages the students to break up into groups of five or six to work on the problem collaboratively. Usually, three problems of medium to high difficulty can be done each session.

*Explanatory notes on inconsistencies with calendar information (if applicable):

The course also introduces nonlinear ordinary differential equations, and power series solutions.

Course number and title:	**MECH 141 – Engineering Fundamentals: I**

Calendar reference:*	**MECH 141** Units: **1.5** Hours: **3-0-1** **Engineering Fundamentals: I** Forces, moments of forces, couples, resultants of force systems; distributed loads; hydrostatics; conditions of equilibrium and applications to particles and rigid bodies in two dimension; analysis of statically determinate structures including beams, trusses and arches; bending moment and shear force diagrams; dry friction. **Note:** *Credit will be granted for only one of 141, 241, and 245.* Page 341 of the 2008-2009 University of Victoria Undergraduate Calendar

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU)**: 43.56**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	43.6 (100%)	0

Professor-in-charge:	Bradley Buckham, PhD, PEng Associate Professor, Mechanical Engineering
Other instructors:	N/A
Teaching assistants: (number/total hours)	5 @ 4.5 hrs/wk = 22.5 hrs/wk (292.5 total hrs/term)

Major topics:	Week 1: General principles; SI units, displacement and force vectors (3 lectures) Week 2: Force resultants (3 lectures) Week 3: Particle equilibrium; the free body diagram (2 lectures) Week 4: Rigid body equilibrium (3 lectures) Week 5 & 6: Structural analysis: methods of joints and sections, and frames and machines (3 lectures) Week 7: Internal Forces: shear and bending moment diagrams (3 lectures) Week 8 & 9: Friction; wedges and screws (2 lectures) Week 11: Centre of gravity and centroids (2 lectures) Week 12: Moments of Inertia (1 lectures) Week 13: Review (3 lectures) Note: The lectures indicated are 1.5 hour lectures

Prescribed text(s):	1. Hibbeler, R.C., *Engineering Mechanics: Statics*, 11th Edition, Prentice Hall, 2007. 2. Instructor prepared PowerPoint overheads. These overheads are available for downloading, etc., from the Mechanical Engineering website at: www.me.uvic.ca/~mech141, where information concerning the course and student progress are updated on a regular basis and available throughout the semester.

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

Total AU's calculated by:

	Weeks	Hours	AU's per Hour	Subtotals
Lectures	12.52	3 hrs/wk	1	37.56
Labs	-	-	-	-
Tutorials	12	1 hr/wk	0.5	6
TOTAL	-	-	-	**43.56**

Course number and title:	**MECH 295 - Engineering Fundamentals: II**

Calendar reference:*	**MECH 295** Units: **1.5** Hours: **3-0-1** **Engineering Fundamentals: II** Ideal gas laws; work and heat; conservation of energy; thermodynamic properties of pure substances; equations of state; applications to open and closed systems; second law of thermodynamics; non-conservation of entropy; energy conversion systems; heat transfer by conduction, convection and radiation. **Note:** *Credit will be granted for only one of 295, ENGR 270.* **Prerequisites:** MATH 101 Page 341 of the 2008-2009 University of Victoria Undergraduate Calendar.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
		X			

CEAB curriculum category content (number of AU)**: 43.56**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	13.1 (30%)	0	30.5 (70%)	0

Professor-in-charge:	Rustom Bhiladvala, PhD Assistant Professor, Mechanical Engineering
Other instructors:	Andrew Rowe, PhD, PEng Associate Professor, Mechanical Engineering
Teaching assistants: (number/total hours)	1 @ 5 hrs/wk = 5 hrs/wk (65 total hrs/term)

Major topics:	[1] Energy conversion & heat transfer for Electrical Engineers: Chip cooling –transistor performance, chip design for low power. Sustainable energy –role of smart grids, solar photovoltaics. Scope of fluid-thermal sciences. Definitions: open, closed isolated systems; property, state, cycle, equilibrium; pure substance. Examples. [2] Processes. Path and point functions. Quasi-equilibrium processes. Forms of Energy. Heat and work interactions. Examples. First Law of Thermodynamics –energy balance for closed systems. Example: electronic chip cooling. [3] Cyclic Processes. Performance of power and refrigeration/heat pump cycles. Property relations. Equations of state. Ideal gas model. Isothermal, isobaric, isochoric, adiabatic, polytropic processes. Examples. Introduction to Steam powerplant. [4] Properties of a pure substance. Liquid, vapour and two-phase property data from tables. T-v, P-v, T-s diagrams. Second Law of Thermodynamics –reversibility; limits of heat engine and refrigeration cycles. Definition and use of the property entropy for processes. First Online & Written Quiz. [5] Evaluating entropy for incompressible substances and for ideal gases. Example –calculations for the Brayton cycle for gas turbine engines. Isentropic process in closed systems. [6-7] Open systems –mass, energy, entropy rate balances. Examples of component calculations: heat exchangers, nozzles, compressors and turbines. Isentropic efficiency. Regeneration, reheat and intercooling for gas turbine cycle. [7-8] Basic cycle calculations for gasoline, diesel and vapour power cycles and for refrigeration cycles. Second Online & Written Quiz. [9] Introduction to Heat transfer modes. Conduction –Fourier's Law. Convection –Newton's Law of cooling; free and forced convection. Radiation –Blackbody radiation. Stefan-Boltzmann Law; emissivity, absorptivity and reflectivity of surfaces; view factors and radiative heat exchange. Heat Conduction: steady, 1-D, conduction –plane, radial and spherical geometries. Thermal resistance and electrical analogies. Composite wall with examples. [10] Heat conduction with energy generation. Fins; fin cooling example problems; fin performance parameters. Transient conduction -lumped capacitance method; Biot and Fourier number use. Examples. [11] Transient conduction: -spatial variation -plane, radial, spherical geometries; calculation examples for glass and microelectronics cooling. Multidimensional conduction. [11-12] Forced Convection in laminar and turbulent external flow -flat plate thermal and hydrodynamic boundary layers; correlations for cylinders, spheres and other geometries. Natural convection – importance in global climate systems –calculations for vertical and horizontal plates and other geometries. Internal flow in pipes and channels. Parallel and counterflow heat exchangers. Review. Final written quiz.

Prescribed text(s):	1. Moran, Shapiro, Munson and DeWitt, *Thermal Systems Engineering*, John Wiley and Sons.

Laboratory experience:	N/A

*Explanatory notes on inconsistencies with calendar information (if applicable):

Total AU's calculated by:

	Weeks	Hours	AU's per Hour	Subtotals
Lectures	12.52	3 hrs/wk	1.0	37.56
Labs	-	-	-	-
Tutorials	12	1 hr/wk	0.5	6
TOTAL	-	-	-	**43.56**

Course number and title:	**MECH 410 - Computer Aided Design**

Calendar reference:*	**MECH 410** Units: **1.5** Hours: **3-3*-0** **Computer Aided Design** Basic elements of CAD and relevance to current industrial practice. Input and output devices for geometric modelling systems. Representation of curves and curved surfaces. Graphical programming languages, and development of interactive 3-D computer graphics programs. Numerical optimization and its application to parameter design. **Indicates a 3 hour laboratory taken by students on alternate weeks.* **Prerequisites:** 200 or ENGR 150 or ELEC 200, and MATH 200. Page 342 of the 2008-2009 University of Victoria Undergraduate Calendar

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**: 49.56**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	24.8 (50%)	24.8 (50%)

Professor-in-charge:	Zuomin Dong, PhD, PEng Professor and Chair, Mechanical Engineering
Other instructors:	Mr. Minh Ly*, Senior Programmer Analyst, Mechanical Engineering
Teaching assistants: (number/total hours)	1 @ 3 hrs/wk = 3 hrs/wk (39 total hrs/term)

Major topics:	1. Introduction to CAD/CAE/CAM and Technology Review (1 wk) 2. Computer Hardware and Software for A CAD System (1 wk) 3. Graphical Coordinate Systems (0.5 wk) 4. Reviews on Geometric Transformations and Projections (0.5 wk) 5. An Introduction to the Pro/EN Design Modeling System (1.5 wk) 6. An Overview of Unigraphics NX CAD/CAM/CAE System (0.5 wk) 7. Computer Modeling Techniques (1 wk) 8. An Introduction to Design Optimization (1 wk) 9. Advanced Applications of Pro/ENGINEER (Integrated CAD/CAE/CAM): Structural/Thermal Analysis, Parameter Design Optimization, Automated CNC Tool Path Generation and Animation, and Freeform Surface Design (2 wk) 10. Representation of Curves (1.5 wks) 11. Representation of Surfaces (1 wks) 12. Interactive Computer Graphical Programming (1 wk) 13. Data Organization in CAD (0.5 wk) 14. An Overview of SolidWorks and COSMOS Works (0.5 wk) 15. Advanced CAD Systems and Their Industrial Applications (0.5 wk)

Prescribed text(s):	References: • Lee, K. Principles *of CAD/CAM/CAE Systems*, Addison Wesley, 1999. • Lecture Notes and Tutorials posted at the course website: http://www.me.uvic.ca/~mech410/ • Roger Toogood, *Pro/ENGINEER Wildfire 3.0 Tutorial*, SDC.

Laboratory experience:	Five Laboratories and One Final Project Laboratory 1 Design Modeling - User Interface; 2D Sketching; 3D Modeling; and Engineering Drawing Generation (5 hrs) Laboratory 2 Mechanical Assembly – Modeling of Assembly and Mechanism; and Motion Animation (5 hrs) Laboratory 3 Static Structural (and Thermal) Analysis (4 hrs) Laboratory 4 Sensitivity Analysis and Design Optimization (4 hrs) Laboratory 5 Automated CNC Tool Path Generation & Machining (4 hrs) Final Project: An Application of CAD/CAE/CAM System Using Pro/ENGINEER; or Unigraphics NX; or SolidWorks (requiring Project Presentation and Report)

*Explanatory notes on inconsistencies with calendar information (if applicable):

*Minh Li, the MECH senior programmer analyst, is responsible for computer support during the lab hours.

Total AU's calculated by:

	Weeks	Hours	AU's per Hour	Subtotals
Lectures	12.52	3 hrs/wk	1	37.56
Labs	-	24 hrs/total	0.5	12
Tutorials	-	-	-	-
TOTAL	-	-	-	**49.56**

Course number and title:	**MECH 460 - Computer Aided Manufacture**

Calendar reference:*	**MECH 460** Units: **1.5** Hours: **3-3*-1** **Computer Aided Manufacture** Introduction to manufacturing operations, features of numerically controlled machine tools and types of CNC programming. Manual part programming with G-codes; canned cycles, subprograms, custom macros, simulation program. CNC machining of curved surfaces with ball-mill and end-mill cutters; matching of tool and surface geometry. Curved surface machining strategies and case studies; reverse engineering of curved surface models. **Indicates a 3 hour laboratory taken by students on alternate weeks.* **Prerequisites:** 200 or ENGR 150 or ELEC 200, and MATH 200. Page 343 of the 2008-2009 University of Victoria Undergraduate Calendar

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**: 54.06**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	32.4 (60%)	21.6 (40%)

Professor-in-charge:	Martin Jun, PhD, PEng Assistant Professor, Mechanical Engineering
Other instructors:	Minh Ly*, Senior Programmer Analyst, Mechanical Engineering
Teaching assistants: (number/total hours)	1 @ 4 hrs/wk = 4 hrs/wk (52 total hrs/term)

Major topics:	1. Introduction to manufacturing, syllabus and course outline, lab manual, fundamentals of numerical control 2. NC controller, coordinate systems, programming, manual programming 3. Lab intro, manual programming (G-code), tool path generation methods 4. Manual programming (G-code) examples, machine tool kinematics 5. Computer assisted part programming, Quiz #1 6. Machining principles, machining mechanics, machining forces 7. Machining process modeling, chip formation, tool wear, machine tool vibrations, issues with machining 8. Tool path planning issues, velocity profile generation, linear and circular interpolation, errors in motion, tool path generation for sculptured surface machining, milling strategy planning, tool path resolution planning 9. 5-Axis surface machining, different 5-axis configuration, 5-axis milling turning machine, gouge avoiding method (EMS), Quiz #2 10. Rapid prototyping, role of computers in rapid prototyping 11. Micro- and nano-scale manufacturing and role of computers 12. Case studies of computer aided manufacturing, presentations 13. Presentations, Quiz #3

Prescribed text(s):	1. G.W. Vickers, M. Ly, and R.G. Oetter, *Numerically Controlled Machine Tools,* Ellis Horwood Limited, 1990.

Laboratory experience:	1. CNC lathe. Symbolic FAPT programming on CNC lathe. (3 hrs) 2. CNC machining of 2-D shapes. Draw initials, generate cutter offsets, create CL and G-code files, locate and machine part. (4.5 hrs) 3. Use VERICUT to monitor the CNC machining simulation, find and detect errors, add fixtures and stock models, load NC program, and locate program origin. (3 hrs) 4. Use VERICUT to configure CNC machining setup, add a second setup, perform cut stock transition between setups, and create a new project with multiple setups. (3 hrs) 5. Use Pro/E Manufacturing to define a part, create a graphical tool path, produce a cutter location file, and machine part. (4.5 hrs) 6. CNC machining of 3-D shapes. Use Pro/E to define a suitable curved surface with superimposed engraving to fit within a 6 x 6 x 2 inch block, generate tool paths (for a 1/2 inch diameter end-mill or ball-mill, and engraving tool) and G-code files, transmit G-code file to the CNC machine tool, and locate and machine the part. Emphasize optimum machining strategy and restrict the total machining time to one hour. This lab requires a group presentation in the last week of term. (3 hrs)

*Explanatory notes on inconsistencies with calendar information (if applicable):

*Minh Ly, the MECH senior programmer analyst, was responsible for enabling the CNC equipment.

	Weeks	Hours	AU's per Hour	Subtotals
Lectures	12.52	3 hrs/wk	1	37.56
Labs	-	21 hrs/total	0.5	10.5
Tutorials	12	1 hr/wk	0.5	6
TOTAL	-	-	-	**54.06**

Course number and title:	**PHYS 122** – Mechanics For Engineers

Calendar reference:*	**PHYS 122** Units: **1.5** Hours: **3-3** **Mechanics For Engineers** Kinematics, particle dynamics, curvilinear motion, momentum, angular momentum, energy. **Notes:** - Credit will be granted for only one of 122, 120. - No more than 4.5 units of credit may be obtained from 100-level physics courses. Open to Engineering students only. **Prerequisites:** A minimum grade of B in BC Secondary School Physics 12 and Algebra 12 or Mathematics 12. **Pre- or corequisites:** MATH 100. Page 361 of the 2009-2010 University of Victoria Undergraduate Calendar.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU):	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
49.6		37.2 (75%)		12.4 (25%)	

Professor-in-charge:	Rogerio de Sousa Assistant Professor, Physics and Astronomy
Other instructors:	
Teaching assistants: (number/total hours)	

Major topics:	**Weeks 1-2 Physics and Measurement, Motion in 1D** **Week 3 Vectors** **Week 4 Motion in 2D, The Laws of Motion** **Week 5-6 Circular Motion** **Week 7 Energy of a System** **Week 8-9 Conservation of Energy** **Week 10-11 Linear Momentum and Collisions** **Week 12 Rotation of a Rigid Object** **Week 13 Angular Momentum**

Prescribed text(s):	Serway and Jewett, *Physics for Scientists and Engineers*, 7th ed.

Laboratory experience:	

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course number and title:	**PHYS 125** – Fundamentals of Physics

Calendar reference:*	**PHYS 125** Units: **1.5** Hours: **3-3** **Fundamentals of Physics** Simple harmonic motion; wave motion, sinusoidal waves, phase velocity, Huygens' Principle, resonance, reflection, refraction and interference; sound; the classic Doppler effect; ray and first order matrix optics, total internal reflection and dispersion; the electromagnetic spectrum; optical spectra and electronic structure; de Broglie waves; principles and applications of nuclear structure, nuclear reactions and ionizing radiation. **Note:** No more than 4.5 units of credit may be obtained from 100-level physics courses. Normally open to Engineering students only. **Prerequisites:** 12 or 120; MATH 100; and one of MATH 110, 133, 211, 233A. **Corequisites:** MATH 101. Page 361 of the 2009-2010 University of Victoria Undergraduate Calendar.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
49.6		49.6 (100%)			

Professor-in-charge:	Byoung-Chul Choi, PhD Associate Professor, Physics and Astronomy
Other instructors:	
Teaching assistants: (number/total hours)	Jed Chapin, PhD Sessional Instructor, Physics and Astronomy

Major topics:	**Week 1 Oscillatory Motion** **Week 2 Wave Motion** **Week 3 Sound Waves** **Week 4 Superposition and Standing Waves** **Week 5 Light and Geometric Optics** **Week 6 Image Formation** **Week 7 Interference of Light Waves** **Week 8 Diffraction and Polarization** **Week 9 Relativity** **Week 10 Quantum Physics** **Week 11 Quantum Mechanics** **Week 12 Atomic Physics, Nuclear Structure, Applications of Nuclear Physics**

Prescribed text(s):	Serway and Jewett. *Physics for Scientists and Engineers with Modern Physics*, 6th or 7th edition.

Laboratory experience:	

*Explanatory notes on inconsistencies with calendar information (if applicable):

Course number and title:	**SENG 422 Software Architecture**

Calendar reference and course description:*	Page 367 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-3 Architectural design of complex software systems. Techniques for designing, evaluating and implementing software system structures, models and formal notations for characterizing and reasoning about architectures, tools and generating specific instances of an architecture, and case studies of actual system architectures. Role of Standards. Students must complete a project that involves substantial software design. Students work in teams. Progress is determined through a preliminary design review; presentation; demonstration of the design; and final report. Prerequisites: Either 271 or 330, and either 321 or 365

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU):	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	19.8	29.7

Professor-in-charge:	Dr. Issa Traoré
Other instructors:	Dr. Ahmed Hassan, Mr. Brad Barclay
Teaching assistants: (number/total hours)	1/60

Major topics:	1. Introduction to Software Architecture: Concepts and Guidelines (3 lectures) 2. Software components and connectors (6 lectures) 3. Architectural Patterns and Styles (6 lectures) 4. Architecture Design (6 lectures) 5. Service Oriented Architecture and Web services (3 lectures) 6. CORBA Architecture and Component Model (9 lectures) 7. Architecture Analysis, Review and Evaluation (3 lectures)

Prescribed text(s):	1. Software Architecture- Foundations, Theory and Practice, by R.N. Taylor, N. Medvidovic, E.M. Dashofy 2. Lecture Notes for Software Architecture-SENG422 by I. Traore, University of Victoria, 2009

Laboratory experience:	1. Architecture Transformation, Discovery, and Patterns 2. Socket Programming 3. XML programming with XOM 4. Web Service Implementation 5. CORBA Interface Definition Language (IDL) 6. CORBA Implementation 7. Architecture Analysis

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**SENG 426 Software Quality Engineering**

Calendar reference and course description:*	Page 367 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-2 This course emphasizes software quality engineering as an integral facet of development, from requirements through delivery and maintenance. The students will learn how to choose appropriate quality goals and select, plan, and execute quality assurance activities throughout development and evolution to predictably meet quality and schedule goals. They will learn how quality assurance can be incorporated into process improvement feedback loops that amplify the ability of an organization to cost-effectively prevent and detect faults. Prerequisites: 321 or 371

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	25.1	20.5

Professor-in-charge:	Dr. Issa Traoré
Other instructors:	Dr. Ahmed Ahmed, Mr. Alex Hoole
Teaching assistants: (number/total hours)	1/60

Major topics:	1. Quality assurance processes and standards (2 lectures) 2. Software Inspection (4 lectures) 3. Quality models and Measurements (5 lectures) 4. Testing: Concepts, Issues, and Techniques (1 lectures) 5. Test Activities, Management, and Automation (2 lectures) 6. Domain Partitioning and Boundary Testing (2 lectures) 7. Testing based on Finite-State Machines (2 lectures) 8. Control Flow Testing (3 lectures) 9. Combinational Testing (2 lectures) 10. Integration Testing (2 lectures) 11. Software Reliability Growth Models (3 lectures) 12. Software Reliability Engineering (6 lectures) 13. Fault Tolerance and Failure Containment (3 lectures)

Prescribed text(s):	1. Software Quality Engineering, by Jeff Tian, Wiley, 2005 2. Lecture Notes for Software Quality Engineering-SENG426: I by I. Traore, University of Victoria, 2008

Laboratory experience:	1. Code inspection 2. Test implementation using JUnit Toolkit 3. Test Case Design Using Domain Test Model 4. Test Case Design Using the Basis Path Test Model 5. Test Coverage Analysis and Reporting using Emma Toolkit 6. Reliability Analysis using CASRE Toolkit

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**SENG 440 Embedded Systems**

Calendar reference and description:*	Page 368 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-1 Characteristics and design of embedded systems. Formal models and specification languages for capturing system behavior. Techniques for specification, exploration, and refinement. System partitioning and hardware-software co-design. Tools for validation, verification, and simulation. Quality and performance metrics. Prerequisite: CENG 355 or CSC 355

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	12.5	29.1

Professor-in-charge:	Dr. Mihai Sima
Other instructors:	Ms. Maryam Mizani
Teaching assistants: (number/total hours)	1/45.5

Major topics:	1. Characteristics and design of embedded systems (1 lecture) 2. Quality and performance metrics (2 lectures) 3. Material review - Hardware, software, firmware - Taxonomy of digital systems (3 lectures) 4. Processors for embedded systems (2 lectures) 5. Software optimization techniques (3 lectures) 6. Fixed-point arithmetic (4 lectures) 7. Hardware optimization techniques (1 lecture) 8. Standard peripherals for embedded systems (2 lectures) 9. Project: 10 design examples for partitioning and hardware-software co-design. Includes, obviously, software tools for verification and simulation (10 lectures) 10. Formal models and specification languages for capturing system behavior (4 lectures) 11. Techniques for specification, exploration, and refinement (2 lectures) 12. Midterm solutions and results (1 lecture) (There were 36 one-hour lectures)

Prescribed text(s):	1. Class Notes for SENG 440 Embedded Systems by M. Sima, University of Victoria, revised May 2009. 2. Supplementary text 1: Embedded System Design – A Unified Hardware/Software Introduction by F. Vahid and T. Givargis, Wiley 2002 3. Supplementary text 2: Computers as Components by W. Wolf, Morgan Kauffman 2001

Project experience:	a) Project 1 – Color space conversion b) Project 2 – Audio compression and decompression c) Project 3 – Discrete Cosine Transform and Inverse DCT d) Project 4 – Discrete Fourier Transform and Inverse DFT e) Project 5 – RSA Cryptography f) Project 6 – Matrix factorization and matrix inversion g) Project 7 – FIR and IIR filtering h) Project 8 – Huffman encoding and decoding i) Project 9 – Motion estimation j) Project 10 – Coordinate Rotation Digital Computer (CORDIC)

*Explanatory notes on inconsistencies with calendar information (if applicable):

The calendar description is rather vague. My description emphasizes practical and design aspects. Thus, each project has been presented in class. Topics 10 and 11 are discussed explicitly in a number of dedicated lectures, and implicitly during the project-oriented lectures.

In the future I plan to extend the chapter Hardware Optimization Techniques having FPGAs (thus programmable hardware) as implementation platform.

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**SENG 462 Distributed Systems and the Internet**

Calendar reference and description:*	Page 368 of the 2008-09 University of Victoria Undergraduate Calendar Units: 1.5, Hours: 3-0-1 Basic concepts of distributed systems. Network architecture and internet routing. Message passing layers and remote procedure calls. Process migration. Distributed file systems and cache coherence. Server design for reliability, availability, and scalability. Internet security and electronic commerce. Prerequisites: 330, CSC 360 or CENG 460

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
	0	0	0	21.8	21.8

Professor-in-charge:	Dr. Stephen W. Neville
Other instructors:	N/A
Teaching assistants: (number/total hours)	1/60

Major topics:	1. Introduction (1 Lecture) 2. Course Project (3 Lectures) 3. Distributed Systems Concepts (7 Lectures) 4. Middleware (7 Lectures) 5. Capacity Planning and Analysis (8 Lectures) 6. Security (6 Lectures) 7. Student Project Presentations (3 Lectures)

Prescribed text(s):	1. Lecture Notes for SEng 462 Distributed Systems and the Internet, University of Victoria, 2008 2. Distributed Systems: Concepts and Design, George Coulouris, Jean Dollimore, and Tim Kindberg, Addison Wesley,4th ed., 2005

Laboratory experience:	A significant course project exits worth 40% of the final grade.

*Explanatory notes on inconsistencies with calendar information (if applicable):

Actual laboratory and tutorial hours for the course are reported here.

Course number and title:	**SENG 466 Software for Embedded and Mechatronics Systems**

Calendar reference:*	Page 368 of the 2008-09 University of Victoria Undergraduate Calendar **SENG 466 Software for Embedded and Mechatronics Systems** **Units: 1.5, Hours: 3-1** Software engineering methods and techniques for systematic development and maintenance of embedded and mechatronic systems. Topics include requirements of software that drives mechatronic systems, specifications of mechatronics, real-time and reactive systems, validation, verification, simulation and testing of mechatronics software. Building product-line software architectures of mechatronic systems is also addressed.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
				16.6	30.9

Professor-in-charge:	M. Cheng, PhD, Assistant Professor, Computer Science
Other instructors:	
Teaching assistants: (number/total hours)	

Major topics:	• Mechanics and Mechatronics • Embedded Systems and Precision Engineering • Hardware and Electronic Interfacing • Action, Control and Hybrid Systems • Networking and Communications • Models and Specifications • Concurrency Support • Real Time Programming Concepts

Prescribed text(s):	None

Laboratory experience:	Students, in teams of three, preferably with different educational background (electrical, mechanical and software), are required to design, implement, and instrument an autonomous hovercraft. They must learn all necessary hardware and software interfaces (e.g., USB, SPI, UART, I2C, PWM, A/D, Timers) and must integrate multiple sensors (e.g., sonar, IR, light, joystick) and actuators (e.g., dc motors, servo motors) into a working system. The controlling software (e.g., PID and FSM) is implemented on top of a real time operating system. Extensive instrumentation is done over a 2-way wireless communication link to a base station. Each team is required to maintain an engineering log book and to submit 3 reports describing their engineering design process.

*Explanatory notes on inconsistencies with calendar information (if applicable):

NA

Course number and title:	**SENG 474 Data Mining**

Calendar reference:*	Page 368 of the 2008-09 University of Victoria Undergraduate Calendar **SENG 474 Data Mining** **Units: 1.5, Hours: 3-1** An introduction to data mining. Data preparation, model building, and data mining techniques such as clustering, decisions trees and neural networks will be discussed and applied to case studies. Data-mining software tools will be reviewed and compared.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
				31.9	10.6

Professor-in-charge:	A. Thomo, PhD, PEng applied, Associate Professor, Computer Science
Other instructors:	G. Tzanetakis, PhD, Assistant Professor
Teaching assistants: (number/total hours)	1/90

Major topics:	• Association Analysis • Clustering • Classification • Data exploration and Visualization • Applications

Prescribed text(s):	*Required:* Introduction to Data Mining (First Edition) Pang-Ning Tan, Michael Steinbach, Vipin Kumar Addison Wesley (2005) , ISBN: 0321321367

Laboratory experience:	The labs involve hands on experience with data mining tools and code writing to solve a variety of practical problems introduced in the lectures or lab sessions. The lab instructor starts by explaining the requirements and giving guidelines, and then the students work in groups or individually to complete the assigned problems. In the end of each session the students present their work to the lab instructor and are evaluated according to clearly specified criteria, which typically are: soundness of the solution, performance, and clarity of code.

*Explanatory notes on inconsistencies with calendar information (if applicable):

NA

Course number and title:	**SENG 480C Topics in Software Engineering: Self-Adaptive and Self-Managing Systems**

Calendar reference:*	Page 367 of the 2008-09 University of Victoria Undergraduate Calendar SENG 480 Topics in Software Engineering Units: **1.5,** Hours: **3-0** The topics in this course depend primarily on the interests of the instructor. Entrance to the course will be restricted to third and fourth-year students who meet the prerequisites specified for the topic to be offered. Some topics may require laboratory work as well as lectures.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
				X	

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
				11.3	26.3

Professor-in-charge:	H.A. Müller, PhD, PEng, Professor, Computer Science
Other instructors:	
Teaching assistants: (number/total hours)	1/120

Major topics:	The simultaneous explosion of information and integration of technology and the continuous evolution from software intensive systems to systems of systems to ultra-large-scale (ULS) systems requires new and innovative approaches for building, running and managing software systems. A consequence of this continuous evolution is that software systems must become more versatile, flexible, resilient, dependable, robust, continuously available, energy-efficient, recoverable, customizable, self-healing, configurable, or self-optimizing by adapting to changing contexts and environments. One of the most promising approaches to achieving such properties is to equip software systems with self-adaptation and self-managing mechanisms. The topic of self-adaptive and self-managing systems has been studied in a variety of application areas, including autonomic computing, robotics, control systems, programming languages, software architectures, fault-tolerant computing, and biological computing. In this course, we focus on the software engineering aspects, including the methods, architectures, algorithms, techniques and tools support self-adaptive and self-managing behavior and exciting application areas, including autonomic computing and ULS systems. **Topics** • Dynamical software-intensive systems • Continuous evolution • ULS systems • Autonomic systems • Self-managing systems • Self-Adaptive systems • Feedback control of computing systems

Prescribed text(s):	**Recommended Textbook:** Northrop, L., Feiler, P., Gabriel, R., Goodenough, J., Linger, R., Longstaff, T., Kazman, R., Klein, M., Schmidt, D., Sullivan, K., Wallnau, K.: Ultra-Large-Scale Systems. The Software Challenge of the Future. Technical Report, Software Engineering Institute, Carnegie Mellon University, 134 pages ISBN 0-9786956-0-7 (2006) http://www.sei.cmu.edu/uls

Laboratory experience:	The main part of the SENG 321 lab experience involves major requirements engineering and design projects. The students work in teams of 5-6 people and meet extensively in the lab and with their lab instructors. The labs provide tutorials in several standards including UML 2.0 and IEEE Requirements Specification Standard 830-1998. Throughout the term, each team is both a supplier and a customer for two different projects. In this manner the students have the opportunity to explore real-life requirements engineering situations and negotiations with concrete customers and suppliers. The final deliverables are substantial (i.e., conceptual design document and user manual). The supplier and customer teams are to produce the following deliverables: **Supplier deliverables** • Supplier Deliverable S0—Review of Past Projects • Project Website (updated throughout term) • Supplier Deliverable S1—Functional Specification and Management Plan • Supplier Deliverable S2a—Conceptual Design Document • Supplier Deliverable S2b—Presentation to Customer • Supplier Deliverable S2c—Technical Design Document • Supplier Deliverable S3—User Manual • Supplier Deliverable S4—Demonstration • Supplier Deliverable S5—Evaluation **Customer deliverables** • Customer Deliverable C0—Informal Specification of Requirements • Customer Deliverable C1—Evaluation of Functional Specification and Management Plan • Customer Deliverable C2—Evaluation of S2a—Conceptual Design Document • Customer Deliverable C3-Assessment of Deliverable S4—Demonstration

*Explanatory notes on inconsistencies with calendar information (if applicable):

N/A

Course number and title:	**STAT 254** – Probability and Statistics For Engineers

Calendar reference:*	**STAT 254** Units: **1.5** Hours: **3-0-1** **Probability and Statistics For Engineers** Probability axioms, properties of probability, counting techniques, conditional probability, independence, random variables, discrete and continuous probability distributions, expectation, variance; binomial, hypergeometric, negative binomial, Poisson, uniform, normal, gamma and exponential distributions; discrete and continuous joint distributions, independent random variables, expectation of functions of random vectors, covariance, random samples and sampling distributions, central limit theorem; point and interval estimation; hypothesis testing; linear regression and correlation. **Note:** Credit will be granted for only one of 254, 250, 252, 255, 260. See Credit Limit, page 32. **Prerequisites:** Admission to a BEng program. **Corequisites:** MATH 200. Page 376 of the 2008-2009 University of Victoria Undergraduate Calendar.

CEAB course type: (indicate with X)	**Common core**	**Program compulsory**	**Option compulsory**	**Program elective**	**Other**
	X				

CEAB curriculum category content (number of AU)**:**	**Math**	**Natural science**	**Complementary studies**	**Engineering science**	**Engineering design**
43.6	32.7 (75%)	10.9 (25%)			

Professor-in-charge:	Chedo Barone, MSc., MMus, BA (Mathematics), HBMus Sessional Lecturer, Department of Mathematics and Statistics
Other instructors:	
Teaching assistants: (number/total hours)	

Major topics:	Weeks 1-2 Probability axioms, properties of probability, counting techniques, conditional probability Weeks 3-4 Independence, random variables, discrete and continuous probability Weeks 5-6 Distributions, expectation, variance; binomial, hypergeometric, negative binomial Weeks 7-8 Poisson, uniform, normal, gamma and exponential distributions; discrete and continuous joint distributions Weeks 9-10 Independent random variables, expectation of functions of random vectors, covariance, random samples and sampling distributions Weeks 11-12 Central limit theorem; point and interval estimation; hypothesis testing; linear regression and correlation.

Prescribed text(s):	Devore. *Probability and Statistics for Engineering and the Sciences, 7th ed.*

Laboratory experience:	None

*Explanatory notes on inconsistencies with calendar information (if applicable):
