UNB SAINT JOHN
SENATE CURRICULUM COMMITTEE
FACULTY CALENDAR SUBMISSION SUMMARY


Date submitted to Faculty Curriculum Committee: September 22, 2014
Date submitted to Faculty Council: October 15, 2014
Date submitted to Senate Curriculum:

Revision date:
Revision date:
Revision date:

Format V.4 – Revised October 2009
SECTION B. Changes to course number, title, credit hours, description or prerequisite

B.1 Tracking Number 14-15-39

Indicate changes with an X

| Current Course Number and Title: Stat4703 Regression Analysis |
| Proposed Course Number and Title: |

Number change _____ Title change ____ Description change ____ Prerequisite X
Credit hour change _____ Other (specify): ______

Course Description (proposed Calendar copy including prerequisite and other course description elements (i.e. 3ch, 3C1L): Simple and multiple linear regression, least squares estimates and their properties, tests of hypotheses, F-test, general linear model, prediction and confidence intervals. Orthogonal and non-orthogonal designs. Weighted least squares. Use of a statistical computer package. Note: Credit can be obtained, for only one of STAT 4703, and ECON 4645.
Prerequisite: one of STAT 2793 / BA 2606 / PSYC 3913 / or STAT 3093 (or permission of instructor).

Were consultations made with other faculties that may be affected by the modifications?: n/a
Are there any resource implications?: n/a

Rationale for course modification(s): Currently, the statistical software using in this course is R. It is a script language, and it doesn’t need strong programming language background. Two programming language courses CS 1073 and CS 1003 are not necessary. In this course, only the basic matrix operations are necessary. From current observation of classroom, with two hours introduction of the basic matrix operations, students can pick up them with no problem.

Effective date for modification: As soon as possible
### SECTION C.  Deletions

(incl. Calendar removal & reinstatement)

**C.11 Tracking Number 14-15-40**

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<td>Reinstate in Calendar: ____</td>
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**Number and title of course:** STAT 2783 Introduction to Non-parametric Methods

**If there are any resource implications due to the proposed action, please describe:** n/a

**If other programs are affected by this action, which other faculties were consulted and notified?:** n/a

**Rationale for course removal/deletion/reinstatement:** This course has been listed and never taught almost 10 years. In order to reduce the confusion, we would like to remove this course from the calendar.

**Effective date for action:** As soon as possible
### C.21 Tracking Number 14-15-41

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**Number and title of course**: STAT 3383 Introduction to Stochastic Processes

If there are any resource implications due to the proposed action, please describe: n/a

If other programs are affected by this action, which other faculties were consulted and notified?: n/a

**Rationale for course removal/deletion/reinstatement**: This course has been listed and never taught almost 10 years. In order to reduce the confusion, we would like to remove this course from the calendar.

**Effective date for action**: As soon as possible
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<td>Reinstate in Calendar: ______</td>
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**Number and title of course:** STAT 3713 Introduction to Statistical Decision Theory

**If there are any resource implications due to the proposed action, please describe:** n/a

**If other programs are affected by this action, which other faculties were consulted and notified?:** n/a

**Rationale for course removal/deletion/reinstatement:** This course has been listed and never taught almost 10 years. In order to reduce the confusion, we would like to remove this course from the calendar.

**Effective date for action:** As soon as possible
**SECTION D. Changes to regulations and programs including new program proposals**  
Attach the Information Services & Systems Assessment for new programs or significantly modified programs.  
Attach the UNB Program Modification form if program changes are significant.

**D.11 Tracking Number 14-15-43**

<table>
<thead>
<tr>
<th>Program affected: Bachelor of Science, Statistics Major</th>
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<tbody>
<tr>
<td>New: _____  Existing: <strong>X</strong></td>
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</table>

**Description of new program or changes to existing one:**
1. Include DA4993 as one of upper level STAT courses.
2. Make it clear that taking MATH 3633 will not get credit in Statistics Major.

**Rationale for new program or regulation change(s):**
1. DA4993, Project in Data Analysis, requires students to use statistical methods to analyze a real dataset and/or involves statistical computing and simulations. In the past and in multiple case, this course has been counted as one of the required upper level statistics courses. Based on this fact, we would like this course to be explicitly listed as one of the upper level Statistics courses for the Statistics Major.

2. MATH 3633 is intended for Education students and does not cover upper year mathematics content.

**Effective date for change:** As soon as possible
Program affected: Bachelor of Science, Minor in Statistics
New: _____ Existing: ___X___

Description of new program or changes to existing one:
Make it clear that taking MATH 3633 will not get credit for Minor in Statistics

Rationale for new program or regulation change(s): MATH 3633 is intended for Education students and does not cover upper year mathematics content.

Effective date for change: As soon as possible
INSTRUCTIONS FOR COMPLETION
OF SUBMISSION

Using the style in the Calendar, describe your proposed changes on separate sheets. Group your changes in 4 sections (A - D) and arrange them in alphabetic/numeric order within each section. Copy and paste, as needed, the relevant section, and assign a new sub-number for each item. I.e. A.2, A.3, B.2, etc.

Note: An Information Services & Systems Assessment must be completed for new programs or significantly modified programs. You must also complete the UNB Program Modification form if program changes are significant at:

Statistics

Note: See beginning of Section F for abbreviations, course numbers and coding.

STAT1793  Introduction to Probability and Statistics I  3 ch (3C)
Concepts of population and sample, data collection, descriptive statistics and exploratory
data analysis, frequency distributions, basic probability concepts, random variables,
discrete and continuous probability models and their applications, central limit theorem
and its applications and an introduction to statistical interference. Note: Credit can be
obtained for only one of STAT 1793, STAT 2263, STAT 2593, BA 1605, PSYC 2901.

Prerequisite: Grade 12 Mathematics.

STAT2263  Statistics for Health Sciences  3 ch (3C)
An introductory course in statistics. Probability, application of Bayes' Theorem. Binomial
and Normal random variables. Confidence intervals for means and proportions.
Prediction intervals. Tests of hypotheses. Paired data versus two independent samples.
Examples drawn from the health sciences. Use of a statistical computer package. NOTE:
Credit can be obtained for only one of STAT 1793, STAT 2263, STAT 2593, BA 1605,
PSYC 2901.

Prerequisites: New Brunswick Mathematics 112 GA (Geometry and Applications) and
New Brunswick Mathematics 112 FR (Functions and Relations), or equivalent.

STAT2593  Probability and Statistics for Engineers  3 ch (3C 1T)
Elementary probability, discrete and continuous distributions, characteristics of
distributions. Statistics, sampling, estimation and hypothesis testing, curve fitting, quality
control. Note: Credit can be obtained for only one of STAT 1793, STAT 2263, STAT
2593, BA 1605, PSYC 2901.

Prerequisite: MATH 1013.

STAT2783—Introduction to Non-parametric Methods (O)—3 ch (3C)
An introduction to the ideas and techniques of non-parametric analysis. Included are
studies of the one, two and K samples problems, goodness of fit tests, randomness tests,
and correlation.

Prerequisite: STAT 2793.

STAT2793  Introduction to Probability and Statistics II  3 ch (3C)
Concepts of estimation and test of hypothesis, sampling distributions, confidence interval
estimation and test of hypothesis for proportion(s), mean(s) and standard deviation(s),
association and trend analysis, elementary experimental designs and analysis of variance.
Note: Credit can be obtained for only one of STAT 2793, BA 2606, PSYC 3913.

Prerequisite: STAT 1793.
STAT3083  Probability and Mathematical Statistics I  3 ch (3C)

Prerequisites: MATH 1013 and one of STAT 1793, STAT 2263, STAT 2593, BA 1605, PSYC 2901; or permission of the instructor.

STAT3093  Probability and Mathematical Statistics II  3 ch (3C)
The second half of a two-part sequence covering various topics in probability and statistics. This course provides an introduction to essential techniques of statistical inference. Samples and statistics versus population and parameters. Brief introduction to method of moments and maximum likelihood. Tests and intervals for means, variances and proportions (one and two sample). Multiple regression, residual plots. Analysis of variance. Brief introduction to experimental design. Chi-squared tests. Examples drawn from engineering, computing science and business. Use of a statistical computer package.

Prerequisites: STAT 3083 and one of STAT 2793, BA 2606, PSYC 3913, STAT 2593; or permission of the instructor.

STAT3383 — Introduction to Stochastic Processes (O) — 3 ch (3C)
Poisson processes, Markov chains, renewal theory, and queuing theory.

Prerequisite: STAT 3093.

STAT3703  Experimental Design 3 ch (3C)
Experimental Design methods and theory, one-way and two-way classification models, split plot designs, incomplete blocks, response surface designs. Special emphasis on applications.

Prerequisite: one of STAT 2793, BA 2606, PSYC 3913, or STAT 3093.

STAT3713 — Introduction to Statistical Decision Theory (O) — 3 ch (3C)
Concept of a strategy, utility theory, Bayes Theorem and decision making, min-max theorem and introduction to game theory. Use of a statistical computer package.

Prerequisite: one of STAT 2793, BA 2606, PSYC 3913, or STAT 3093.

STAT4043  Sample Survey Theory (A) — 3 ch (3C)
Simple random sampling; stratified sampling; systematic sampling; multistage sampling; double sampling, ratio and regression estimates; sources of error in surveys.
Prerequisite: one of STAT 2793, BA 2606, PSYC 3913, or STAT 3093.

**STAT4203 Introduction to Multivariate Data**  Analysis (O)  3 ch (3C)
Multivariate normal distribution; multivariate regression and the analysis of variance; canonical correlations; principal components; classification procedures; factor analysis; computer applications. Student should have some exposure to matrix algebra.

Prerequisite: one of STAT 2793 / BA 2606 / PSYC 3913 / or STAT 3093, MATH 1503 or MATH 2213 (or permission of the instructor).

**STAT4243 Statistical Computing**  (A)  3 ch (3C)
Course will include random number generation, simulation of random variables and processes, Monte Carlo techniques and integral estimation, the computation of percentage points and percentiles, as well as resampling methods.

Prerequisite: one of STAT 2793 / BA 2606 / PSYC 3913 / or STAT 3093, and CS 1073 or CS 1003 (or permission of the instructor).

**STAT4703 Regression Analysis**  3 ch (3C)
Simple and multiple linear regression, least squares estimates and their properties, tests of hypotheses, F-test, general linear model, prediction and confidence intervals. Orthogonal and non-orthogonal designs. Weighted least squares. Use of a statistical computer package. Note: Credit can be obtained, for only one of STAT 4703, and ECON 4645.

Prerequisite: one of STAT 2793 / BA 2606 / PSYC 3913 / or STAT 3093, and CS 1073 or CS 1003 (or permission of the instructor) and MATH 1503 or MATH 2213 (or permission of instructor).

**STAT4803 Topics in Statistics**  (O)  3 ch (3C)
Selected topics at an advanced level. Content will vary. Topic of course will be entered on student’s transcript. Course will be considered as an upper level elective for Information Sciences students and for Mathematics and Statistics Majors.

Prerequisite: STAT 3093 or consent of instructor.
Statistics Option

Statistics Major  First Year (Minimum 38 ch)

a. MATH 1003, MATH 1013, MATH 1503

b. At least 18 ch in lecture courses and at least 8 ch in laboratory courses chosen from:

   BIOL 1105, BIOL 1205, BIOL 1017
   CHEM 1041, CHEM 1046, CHEM 1072, CHEM 1077
   GEOL 1044, GEOL 1074
   PHYS 1011, PHYS 1012, PHYS 1021, PHYS 1022.

c. A minimum of 3 ch in approved electives. NOTE: Geology courses include laboratory component

Second Year (Minimum 31 ch)

MATH 2513, MATH 2523, STAT 1793, STAT 2793 plus electives equivalent to six term courses. It is recommended that some of these electives be Computer Science courses.

Third Year and Fourth Year (Minimum 60 ch)

a. MATH 3713, MATH 3733, STAT 3083, STAT 3093 plus 15 ch of upper level STAT courses which may include DA4993. An upper level MATH course may contribute to these 15 ch.

b. Plus 24 ch of upper level (3-4000 level) elective courses approved by the department.
   c. Plus an additional 9 ch of electives at any level.

Notes:

1. At least 6 ch of Computer Science are required in the program.
2. MATH 3633 can not be taken for credits in Statistics Major.

Minor in Statistics
A student who intends to pursue a Minor in Statistics is required to take 24 ch in Statistics. A maximum of 9 ch from Mathematics may be selected. **MATH 3633 can not be taken for credits in Minor in Statistics.** The Minor must be declared at the same time as the Major.
SECTION A. New courses

A.1 Tracking Number 2014-15-62

**Proposed course number, title and credit hours:** CS 4403 Data Mining (O) (Cross-listed: DA 4403)

**Course description** (proposed Calendar copy, including calendar codes): 4 ch (3C 1L)


Is this course similar to another offered by or likely to affect another Faculty or Department; if so, which one?: no

Does the faculty currently have the human resources/specialty knowledge/workload capacity required to deliver this course?: N/A (created just for cross-listing purposes)

List additional needs (if any) Computer lab / SMART room / specialized software / laboratory: Same as DA4403

Library needs: N/A

Name of librarian or staff member of *Information Service & Systems (ISS)* consulted and date of consultation:
Rationale and other information to support this submission:

CS students are not seeing this course as a good option for them, because it is not visible from a CS point of view (i.e., in the list of courses considered to be in the Computer Science area). The cross-listing shall solve this problem.

Effective date: As soon as possible

SECTION B. Changes to course number, title, credit hours, description or prerequisite

B.1 Tracking Number 2014-15-63
Indicate changes with an X

Current Course Number and Title: CS 1003 Introduction to Computer Programming 4ch (3C 1T 2L)

Proposed Course Number and Title:

Number change _____ Title change ____ Description change ____ Prerequisite __X__
Credit hour change _____ Other (specify): _______

Course Description (proposed Calendar copy including prerequisite and other course description elements (i.e. 3ch, 3C1L): 4 ch (3C 1T 2L)

Intended for Science, Applied Science and Engineering students. Introduces the use of digital computers. Includes: problem analysis; algorithm design, and program structure. Use of procedures, loops, and arrays. Debugging and verification of programs. Note: Credit will be granted for only one of the following courses: CS 1003, CS 1073, CS 1616, or IT 2773. Co-requisite: (MATH1003 or MATH1001) and MATH1503.

Were consultations made with other faculties that may be affected by the modifications?: yes (dept. of engineering)

Are there any resource implications?: no

Rationale for course modification(s):

To make the course in line with the one offered in Fredericton. Their co-requisite is actually PHYS 1081, but this course has MATH1003 and MATH1503 as co-requisites. Since it is only the mathematical background that has been an issue recently, only this part of the requirement has been kept. We added the possibility of using MATH1001 rather MATH1003, so that students in other disciplines (like in Biology) could take this course as well.

Effective date for modification: As soon as possible
**B.21 Tracking Number 2014-15-64**

*Indicate changes with an X*

| Current Course Number and Title: | CS 3913   Algorithmics   4ch (3C 1T) |
| Proposed Course Number and Title: | CS 3913   Algorithmics   4ch (3C) |

Number change _____  Title change _____  Description change __X__  Prerequisite _____
Credit hour change _____  Other (specify): __X__

**Course Description** (proposed Calendar copy including prerequisite and other course description elements (i.e. 3ch, 3C1L): 4 ch (3C)
Continues the study of algorithms begun in CS2383. Covers advanced techniques for analyzing recursive algorithms, examines major algorithm-design approaches including greedy, divide and conquer, dynamic programming, and graph-based approaches. Considers randomized algorithms and introduces complexity theory, including NP-completeness. One or more advanced topics will be chosen from the following areas: algorithmic problems arising in artificial intelligence, state spaces and search strategies, parallel and distributed algorithms. Prerequisites: CS2383 and CS2333.

*Were consultations made with other faculties that may be affected by the modifications?:* N/A

*Are there any resource implications?:* no

**Rationale for course modification(s):**

Change to course description:
CS3323 has been replaced by CS2383 a few years ago. However, the description above was not updated accordingly at the time.

Change to tutorial hour:
There has never been a tutorial scheduled for this course. This change just reflects current practice.

**Effective date for modification:** As soon as possible
**B.31 Tracking Number 2014-15-65**

*Indicate changes with an X*

| Current Course Number and Title: CS 3813  Computer Organization  4ch (3C 1T) |
| Proposed Course Number and Title: CS 3813  Computer Architecture and Organization  4ch (3C 2L*) |

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<th>Description change _____</th>
<th>Prerequisite _____</th>
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<tr>
<td>Credit hour change _____</td>
<td>Other (specify): <strong>X</strong></td>
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**Course Description** (proposed Calendar copy including prerequisite and other course description elements (i.e. 3ch, 3C1L): 4 ch (3C 2L*)

Advanced concepts in assembly language programming, functional organization of a computer system, organization of CPU, organization of I/O, interrupts, memory organization, cache and virtual memories, performance enhancements, pipelining, superscalar processors and, embedded systems. Prerequisite: CMPE 2213 or CS2803 , and CS2253 .

**Were consultations made with other faculties that may be affected by the modifications?**: N/A

**Are there any resource implications?**: no, as this course is typically offered by a full-time faculty member, and labs and tutorials are incorporated in the course workload.

**Rationale for course modification(s):**

**Title change:**

This is just a title change, to better reflect the content of the course.

**Course code change:**

There has never been a tutorial scheduled for that course, so this is just reflecting current practice. A lab has been added because this course needs a lab for a proper hands-on coverage of the topics.

**Effective date for modification**: As soon as possible
B.41 Tracking Number 2014-15-66

Indicate changes with an X

| Current Course Number and Title: DA 4403 Data Mining (O) 4ch (3C) |
| Proposed Course Number and Title: DA 4403 Data Mining (O) 4ch (3C 1L) (Cross-listed: CS 4403) |

| Number change ______ | Title change ___ | Description change ___ | Prerequisite ____ |
| Credit hour change ____ | Other (specify): ___X___ |

Course Description (proposed Calendar copy including prerequisite and other course description elements (i.e. 3ch, 3C1L): 4 ch (3C 1L):


Were consultations made with other faculties that may be affected by the modifications?: N/A

Are there any resource implications?: Extra contact hours would have to be paid in the case the course is covered by a stipend. This could probably be waived though when the class size is small enough to fit in one lab (assuming that the whole course has a hands-on format, and is given totally in a lab environment).

Rationale for course modification(s):

The cross-listing:

CS students are not seeing this course as a good option for them, because it is not visible from a CS point of view (i.e., in the list of courses considered to be in the Computer Science area). The cross-listing shall solve this problem.

Adding a 1-hour lab:

This course does require some hands-on experience with various data mining tools. This can only be provided in a lab. Having the course entirely taught in a lab environment may remove the need for such extra lab time, but the description has to fit to classes of any size.

Effective date for modification: As soon as possible.
### B.5 Tracking Number 2014-15-67

**Indicate changes with an X**

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<td>CS 2803 Logic Design 4ch (3C 2L*)</td>
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<th>Prerequisite</th>
<th>Credit hour change</th>
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**Course Description** (proposed Calendar copy including prerequisite and other course description elements (i.e. 3ch, 3C1L): 4 ch (3C 2L*)

Switching algebra and its application in analysis and synthesis of combinational and clocked sequential circuits; minimization and realization methods. Universal logic gates, error detection and correction, register and counter operations, and memory systems. Note: Credit will not be given for both CMPE 2213 and CS 2803. Prerequisites: CS 1003 or CS 1073.

**Were consultations made with other faculties that may be affected by the modifications?:** N/A

**Are there any resource implications?:** no

**Rationale for course modification(s):**

The duration of the labs is appropriate for the tasks to be accomplished, but it is not necessary to have it every week in order to give proper training to the students.

**Effective date for modification:** As soon as possible
### B.6 Tracking Number 2014-15-68

*Indicate changes with an X*

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<tr>
<th>Current Course Number and Title:</th>
<th>CS 3033  Software Design and Development  4ch (3C 1T)</th>
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<tr>
<td>Proposed Course Number and Title:</td>
<td>CS 3033  Software Design and Development  4ch (3C)</td>
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| Number change | Title change | Description change | Prerequisite | Credit hour change | Other (specify): | X |
|---------------|--------------|--------------------|--------------|--------------------|-----------------|

**Course Description** *(proposed Calendar copy including prerequisite and other course description elements (i.e. 3ch, 3C1L): 4 ch (3C))*

Presents advanced modeling techniques (mostly UML) for object oriented and real-time design. Includes related topics such as design patterns, quality, reusability, and CASE tools. Prerequisite: CS 2043.

**Were consultations made with other faculties that may be affected by the modifications?:** N/A

**Are there any resource implications?:** no

**Rationale for course modification(s):**

Tutorials have never been scheduled for this course, and they are not needed. The new code reflects the current practice.

**Effective date for modification:** As soon as possible
**B.7 Tracking Number 2014-15-69**

*Indicate changes with an X*

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**Course Description** (proposed Calendar copy including prerequisite and other course description elements (i.e. 3ch, 3C1L): 4 ch (3C 2L*)

This course will discuss the building blocks required for undertaking parallel computation on shared memory architectures. Differences between programming on shared memory multiprocessors and distributed memory processors will be discussed. Software will include performance analysis tools and message passing libraries such as OpenMP and MPI. Prerequisite: CS 1083. Co-requisite: CS3403.

**Were consultations made with other faculties that may be affected by the modifications?:**

N/A

**Are there any resource implications?:** If taught by a stipend, there will be an extra cost of the extra lab hours.

**Rationale for course modification(s):**

This course needs a lab for a proper hands-on coverage of the topics.

**Effective date for modification:** As soon as possible
B.81 Tracking Number 2014-15-70

Indicate changes with an X

<table>
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<tr>
<th>Current Course Number and Title:</th>
<th>CS 3403 Operating Systems 4ch (3C)</th>
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<td>CS 3403 Operating Systems 4ch (3C 2L*)</td>
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</tbody>
</table>

Number change _____ Title change ___ ___ Description change ____ Prerequisite ____
Credit hour change _____ Other (specify): ___X___

**Course Description** (proposed Calendar copy including prerequisite and other course description elements (i.e. 3ch, 3C1L): 4 ch (3C 2L*))

This course examines the fundamental role of an Operating system. Topics covered are: process/threads, process management, process synchronization, CPU scheduling, storage management, I/O management, security and user interfaces. Examples are drawn from contemporary operating systems. Prerequisite: CS 2253 and 70ch completed.

*Were consultations made with other faculties that may be affected by the modifications?*: N/A

*Are there any resource implications?*: no, as this course is typically offered by a full-time faculty member, and labs and tutorials are incorporated in the course workload.

**Rationale for course modification(s):**

This course needs a lab for a proper hands-on coverage of the topics.

**Effective date for modification**: As soon as possible
B.9 Tracking Number 2014-15-71

Indicate changes with an X

<table>
<thead>
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<th>Current Course Number and Title:</th>
<th>CS 4525  Database Management Systems II  4ch (3C 2L)</th>
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<td>Proposed Course Number and Title:</td>
<td>CS 4525  Database Management Systems II  4ch (3C 2L*)</td>
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Number change ________ Title change ___ ___ Description change _____ Prerequisite _____
Credit hour change ______ Other (specify): ___ X ___

Course Description (proposed Calendar copy including prerequisite and other course description elements (i.e. 3ch, 3C1L): 4 ch (3C 2L*)

File systems and structures, advanced query languages, query optimization, concurrency control and recovery, security and integrity. Overview of non-relational database models. Prerequisites: INFO 1103 , CS 3403 , and 70 ch completed.

Were consultations made with other faculties that may be affected by the modifications?: N/A

Are there any resource implications?: no

Rationale for course modification(s):
The duration of the labs is appropriate for the tasks to be accomplished, but it is not necessary to have it every week in order to give proper training to the students.

Effective date for modification: As soon as possible
B.10 **Tracking Number 2014-15-72**

*Indicate changes with an X*

<table>
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<th>Current Course Number and Title:</th>
<th>CS 4613   Programming Languages   4ch (3C)</th>
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<td>CS 4613   Programming Languages   4ch (3C 1T)</td>
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</table>

- Number change _____
- Title change __ __
- Description change _____
- Prerequisite _____
- Credit hour change _____
- Other (specify): ___X___

**Course Description** (proposed Calendar copy including prerequisite and other course description elements (i.e. 3ch, 3C1L): 4 ch (3C 1T))

Structure and major characteristics of programming languages; formal definition, syntax, semantics. Comparative study of principal language concepts and their treatment in imperative, functional, logic, and object-oriented languages. Prerequisites: CS2333, CS2043 and 90 ch completed.

**Were consultations made with other faculties that may be affected by the modifications?:** N/A

**Are there any resource implications?:** no, as this course is typically offered by a full-time faculty member, and labs and tutorials are incorporated in the course workload.

**Rationale for course modification(s):**

This difficult core course would benefit from having an extra 1-hour tutorial to cover more examples.

**Effective date for modification:** As soon as possible
B.11 Tracking Number 2014-15-73

Indicate changes with an X

<table>
<thead>
<tr>
<th>Current Course Number and Title:</th>
<th>CS 4893  Network Programming  4ch (3C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Course Number and Title:</td>
<td>CS 4893  Network Programming  4ch (3C 2L*)</td>
</tr>
</tbody>
</table>

Number change _____  Title change ___  Description change ____  Prerequisite ____
Credit hour change _____  Other (specify): ___X___

Course Description (proposed Calendar copy including prerequisite and other course description elements (i.e. 3ch, 3C1L): 4 ch (3C 2L*)

Threads, socket programming (client & server), secure sockets, multicast sockets, protocol handlers, content handlers, RMI, Mail API and social networks. Uses Java programming language. Prerequisites: CS 1083 , CS 3893 .

Were consultations made with other faculties that may be affected by the modifications?: N/A

Are there any resource implications?: no, as this course is typically offered by a full-time faculty member, and labs and tutorials are incorporated in the course workload.

Rationale for course modification(s):
This course needs a lab for a proper hands-on coverage of the topics.

Effective date for modification: As soon as possible
B.12 Tracking Number 2014-15-74

Indicate changes with an X

<table>
<thead>
<tr>
<th>Current Course Number and Title:</th>
<th>CS 4983 Technical Report 2ch (2C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Course Number and Title:</td>
<td>CS 4983 Technical Report 2ch (2S)</td>
</tr>
</tbody>
</table>

Number change ______ Title change __ __ Description change _____ Prerequisite _____
Credit hour change ______ Other (specify): ___X___

Course Description (proposed Calendar copy including prerequisite and other course description elements (i.e. 3ch, 3C1L): 2 ch (2S):

Builds on the skills developed in CS 3983, through the preparation and presentation of a technical report. A supervisor approved by the Department must normally be chosen before the beginning of the term. Prerequisite: CS 3983.

Were consultations made with other faculties that may be affected by the modifications?: N/A

Are there any resource implications?: no

Rationale for course modification(s):

In this course, there have never been formal (regular) contact hours with the students. Students normally meet with the course coordinator for an introduction to the course, and then they work independently with a supervisor. The change to “2S” (in the course code) reflects the fact that students should attend seminars during the term they are registered to this course, and have regular communication (meetings) with their supervisor and with the course coordinator.

Effective date for modification: As soon as possible
SECTION C. Deletions
(incl. Calendar removal & reinstatement)

C.11 Tracking Number 2014-15-75

Select 1 action:
- Remove from Calendar but do not delete: ______
- Delete from Calendar: ______
- Reinstate in Calendar: __X__

Number and title of course: CS 2617 C++ for Java Programmers 1 ch (2C)

If there are any resource implications due to the proposed action, please describe:
Obviously, someone would have to teach it. However, since the collective agreement for CAE, we had to change our budget allocation because payment is based on contact hours (including labs and tutorials) rather than term-course. With this change, we often end up with a left-over in the budget for a third of a term-course, but not being able to use it. This re-instated course would use such left-over.

If other programs are affected by this action, which other faculties were consulted and notified?: no

Rationale for course removal/deletion/reinstatement:
Since we removed this course from the calendar, we did have comments from industry that it would be an asset if students knew this programming language (C++), and we totally agree with that.

Effective date for action: As soon as possible
SECTION D. Changes to regulations and programs including new program proposals

Attach the Information Services & Systems Assessment for new programs or significantly modified programs.
Attach the UNB Program Modification form if program changes are significant.

D.11 Tracking Number 2014-15-76

Program affected: Bachelor of Science in Computer Science

New: _____ Existing: __X__

Description of new program or changes to existing one:

1. Remove the possibility to get credits for MATH3633 in this degree
2. Make it clear that free electives are necessary to complete the total of 141ch required
3. Update the title of CS3813
4. Add “CS 4893 Network Programming” under the “2 of” category.
5. Add a note under the requirements for free electives, indicating that it is encouraged to take a course in a newer area of computing.
6. Remove the point that students admitted in the programme before May 2003 have a different rule regarding the grade to obtain, in comparison with students admitted after that time.
7. Reorganizing the sections into “general information”, “regulations”, “curriculum”, “computer science core requirements”, and “mathematics and statistics core requirements”.
8. Under the “general information” section, better indicate what the CS part of the department is offering.
9. Some text rewritten.

Rationale for new program or regulation change(s):

1. Some students have tried this in the past, even if we do not consider this course as a real upper-level MATH course within a computer science degree. The description of MATH3633 does recognize this possibility and recommend approval by the Chair of the department, but this does not seem to be sufficient.
2. This comes from a recommendation from Scott Thomas, the SASE student advisor, who did notice the confusion from some students.
3. If the course title for CS3813 gets changed, it has to be changed here as well.
4. The “2 of” category is a list of advanced courses in one of the 5 key areas of computer science, which helps us meet one of the criteria for the accreditation (CIPS) of our degree. Since CS 4893 actually fits under this criteria as well, it has been added in this “2 of” category.
5. This recommendation follows the criteria for CIPS accreditation. Advising sheets shall contain the list of courses currently offered, that meet this definition.
6. This does not affect students anymore.
7. Make the different sections more meaningful and the text easier to understand.
8. Complete information would be more informative to the students.
9. Just an improvement on the text. The meaning or amount of information is not changed.
**Effective date for change:** As soon as possible

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**D.21 Tracking Number 2014-15-77**

**Program affected:** IT minor  
**New:** ____ **Existing:** ____X__

**Description of new program or changes to existing one:**
Rewriting the first sentence.

**Rationale for new program or regulation change(s):**
Make the text more explicit.

**Effective date for change:** As soon as possible
Computer Science

**CS 1003  Introduction to Computer Programming  4 ch (3C 1T 2L)**
Intended for Science, Applied Science and Engineering students. Introduces the use of digital computers. Includes: problem analysis; algorithm design, and program structure. Use of procedures, loops, and arrays. Debugging and verification of programs. Note: Credit will be granted for only one of the following courses: **CS 1003**, **CS 1073**, **CS 1616**, or **IT 2773**. Prerequisite: High School Mathematics. Co-requisites: (MATH 1003 or MATH 1001) and MATH 1503.

**CS 1023  Data Structures and Algorithms  4 ch (3C 2L)**
Intended for Science, Applied Science, and Engineering Students. Introductions to the ideas of abstraction of procedures and data. Handling of the fundamental data types: lists, stacks, queues, and graphs. Basic concepts of discrete mathematics, elements of combinatorics, aspects of complexity and recursion and algorithm development, including estimation of program resource utilization. Note: This course may not be taken for credit by CS students. Prerequisite: **CS 1003**.

**CS 1073  Introduction to Computer Programming I (in Java)  4 ch (3C 1.5L 1T)**
Covers fundamental concepts such as decisions, loops, arrays, classes, methods, and inheritance; focusing on problem analysis, algorithm design, program structure and readability. Introduction to the Java API libraries. Note: Credit will be granted for only one of the following courses: **CS 1003**, **CS 1073**, **CS 1616**, or **IT 2773**. Prerequisite: High School Mathematics.

**CS 1083  Introduction to Computer Programming II (in Java)  4 ch (3C 1.5L 1T)**
Continues **CS 1073** focusing on problem analysis, algorithm design, program structure and readability. Covers recursion, sorting and searching, data abstraction, encapsulation, inheritance, polymorphism, simple data structures and files, testing and debugging. Prerequisite: ( **CS 1073** with a "C" or better) or ( **IT 2773** with a "C" or better, and High School Mathematics or **MATH 1863** or permission of the instructor).

**CS 1303  Discrete Structures  4 ch (3C 1T)**
Introduces topics in discrete mathematics important in computer science, including: propositional logic, predicate logic using quantifiers, direct and indirect proofs, summation and product notation, mathematical induction, elementary set theory and counting. Students are expected to write mathematical proofs throughout the course. Note: Credit will not be given for both CS 1303 and **MATH 2203**. Students majoring in Mathematics or Statistics must choose **MATH 2203**. Prerequisite: High School Mathematics.
CS 1616  Java Programming Overview  1 ch
An overview of basic Java programming concepts including arrays. Intended for students with
credit for High School CS120. Course will run 1 hour per week in the fall term. Note: Credit will
be granted for only one of the following courses: CS 1003, CS 1073, CS 1616, or IT 2773.
Prerequisite: High School CS 120.

CS 2043  Software Engineering I  4 ch (3C 2L)
Introduction to fundamentals of the discipline of software engineering with focus on the
software development life cycle. Topics include software development methodologies and
processes, requirements, analysis, modeling, architecture, design, implementation, testing, and
maintenance. Basics of software management are also introduced. Note: Credit is not given for
both CS 2013 and CS 2043. Prerequisite: CS 1083.

CS 2113  Scientific Computing  4 ch (3C)
An introduction to numerical techniques for solving scientific problems. Topics to include
sequences, series, structured linear systems, polynomial models, quadrature,
differential/difference equations and root finding. Use of existing numerical software packages
and a basic introduction to scientific programming using a high-level language.
Prerequisites: MATH 1013 and one of CS 1073, IT 2773 or CS 1003.

CS 2253  Machine Level Programming  4 ch (3C 2L)
Introduces students to lower-level computer operations and the association with higher-level
procedural programming constructs. Topics include binary representation of data, instruction
formats and execution, assembler programming, scope, functions, user-defined data types
using both low-and high-level programming languages. Note: Credit is not given for both CS
2253 and CS 2813. Prerequisites: CS 1083 and (CS 1303 or permission of instructor).

CS 2333  Computability and Formal Languages  4 ch (3C 1T)
This course introduces students to some of the fundamental ideas in theoretical computer
science: functions and relations, formal languages, finite automata, regular languages, context-
free grammars, context-free languages, push-down automata, pumping lemmas, Turing
machines, the Church-Turing thesis, recursive and recursively enumerable languages, the
Chomsky hierarchy, the halting problem and other unsolvable decision problems, problem
reducibility, and fundamental computational complexity classes. Note: Credit is not given for
both CS 2333 and CS 2303. Prerequisites: CS 1303, 30 ch and (CS 1073 or CS 1003).

CS 2383  Data Structures and Algorithms  4 ch (3C 1T)
 Presents formal specifications of abstract data types and their data structure representations,
operations, and algorithms. Include priority queues, dictionaries, graphs, heaps, hash tables, binary search trees, balanced trees, and graph adjacency representations. Covers sorting, searching, dynamic storage handling, and fundamental graph algorithms. Asymptotic analysis of time and space complexity are taught and used throughout the course. Students are expected to implement a variety of data structures and graph algorithms. Note: Credit is not given for both CS 2383 and CS 3323. Prerequisites: CS 1083 and CS 1303.

CS 2616  Java for Programmers  1 ch (2C)
Basic language constructs (input/output, variables and types, control structures.) Object oriented concepts, such as classes, objects, attributes and methods. Programming with multiple classes. This course is given over an 8 week period as follows: 2 hours/week for 3 weeks followed by midterm test plus 2 hours/week for 3 weeks followed by final examination. Course drop date is one week after the midterm test. Note: Credit will not be given for both CS 1083 and CS 2616. Prerequisite: Two term courses (at least 6 ch) in programming, excluding CS 1083.

CS 2803  Logic Design  4 ch (3C 2L*)
Switching algebra and its application in analysis and synthesis of combinational and clocked sequential circuits; minimization and realization methods. Universal logic gates, error detection and correction, register and counter operations, and memory systems. Note: Credit will not be given for both CMPE 2213 and CS 2803. Prerequisites: CS 1003 or CS 1073.

CS 2998  Programming Project  4 ch
This individual study course provides an opportunity for students to learn programming languages that are not otherwise part of their degree program. The students first teach themselves a programming language, approved by the department, and then develop a program using this language. This is done under the supervision of a faculty member. A presentation of the program developed is required. Note: the course may not be taken for credit for by BScCS or BCS students. Prerequisite: Approval of the Department.

CS 3033  Software Design and Development  4 ch (3C-1T)
Presents advanced modeling techniques (mostly UML) for object oriented and real-time design. Includes related topics such as design patterns, quality, reusability, and CASE tools. Prerequisite: CS 2043.

CS 3113  Introduction to Numerical Methods  4 ch (3C)
Error analysis, convergence and stability. Approximation of functions by polynomials. Numerical quadrature and differentiation. The solution of linear and non-linear equations and
the solution of ordinary differential equations. Emphasizes the development of computer algorithms and stresses the influence of finite precision and arithmetic on computational results. Prerequisites: (CS 1003 or CS 1073, MATH 1013) or CS 2113, and MATH 1503 or MATH 2213.

CS 3123 High Speed Computing 4 ch (3C 2L*)
This course will discuss the building blocks required for undertaking parallel computation on shared memory architectures. Differences between programming on shared memory multiprocessors and distributed memory processors will be discussed. Software will include performance analysis tools and message passing libraries such as OpenMP and MPI. Prerequisite: CS 1083. Co-requisite: CS3403.

CS 3403 Operating Systems 4 ch (3C 2L*)
This course examines the fundamental role of an Operating system. Topics covered are: process/threads, process management, process synchronization, CPU scheduling, storage management, I/O management, security and user interfaces. Examples are drawn from contemporary operating systems. Prerequisite: CS 2253 and 70ch completed.

CS 3423 Data Management (A) 4 ch (3C)
Discussion of selected topics at an advanced level concerning the storage and manipulation of data. The use of an advanced operating system (e.g. UNIX) for shell programming. Regular expressions and their use in data manipulation utilities. A very high-level language (e.g. Perl) suited for data manipulation. Handling data over the Internet (e.g. CGI). Prerequisite: CS 1083 and 70 ch completed.

CS 3553 – Introduction to Bioinformatics (Cross-listed: BIOL 3553) 4ch (3C)
Even before the completion of the Human Genome Sequencing Project biomedical databases have stored massive amounts of DNA and protein sequence information that have been analysed and reused in biomedical studies. Today the underlying technologies and analytical tools supporting genomic data analysis make up the field known as Bioinformatics. This course will introduce core topics and tools in genomics and bioinformatics explained from a practical perspective. Students taking this course will receive hands on training in many of the following areas of study: Genome Sequencing techniques, Gene Prediction, Sequence Alignment, Sequence Databases, Genome and Protein Structure Annotation, Bioinformatic Visualization Techniques, Gene Ontology, Analysis of Scientific Literature, Biomedical Text Mining, Workflow Management Systems, Bioinformatics Web Services. Prerequisites: 60 credit hours completed in a BSc (Biology, Marine Biology, Environmental Biology, or Biology-Psychology) or in a BScCS; or permission of instructor.

CS 3693 Advanced Program Development 4 ch (3C)
This course explores advanced features of Java such as inner/nested classes, finalizers, cloning,
reflection, reference objects, object serialization, Java Beans, Java Native Interface, internationalization, security, assertions and enterprise features. Emphasis will be on reading technical documentation, searching libraries and effective use of Java development tools for debugging, obfuscation, decompilation and documentation. The course also covers Unix features for program development and a team project forms an important part of this course. Prerequisite: **CS 1083** and 70 ch completed.

**CS 3773  Topics in Web Science   4 ch (3C)**
Web Science is concerned socio-technical aspects of the World Wide Web. Understanding it requires analysis of its architecture and applications, the people, organizations, policies and economics that are affected by and affect it. Web science integrates computer and information sciences with sociology, economics, political science, law, management, language and communication, geography and psychology. This course explores Web: History and Methodology, Semantics, Analysis, Society, Network Studies, Governance and Trust, Health education, and Health Care. Prerequisites: 70ch completed or permission of the instructor.

**CS 3813  Computer Architecture and Organization   4 ch (3C 1T2L*)**
Advanced concepts in assembly language programming, functional organization of a computer system, organization of CPU, organization of I/O, interrupts, memory organization, cache and virtual memories, performance enhancements, pipelining, superscalar processors and, embedded systems. Prerequisite: **CMPE 2213** or **CS2803**, and **CS2253**.

**CS3893 Computer Networking 4 ch (3C)**
This course provides an in-depth look at the hardware and software behind the Internet and other computer networks. Topics include OSI network architecture, communication protocols, UDP and TCP, socket programming, common application-level protocols, congestion control, routing protocols, Internet Protocol, link layer services, network security. Prerequisites: CS2253. Co-requisite: CMPE 2213 or CS 2803.

**CS 3913  Algorithmics   4 ch (3C-1T)**
Continues the study of algorithms begun in **CS3323-CS2383**. Covers advanced techniques for analyzing recursive algorithms, examines major algorithm-design approaches including greedy, divide and conquer, dynamic programming, and graph-based approaches. Considers randomized algorithms and introduces complexity theory, including NP-completeness. One or more advanced topics will be chosen from the following areas: algorithmic problems arising in artificial intelligence, state spaces and search strategies, parallel and distributed algorithms. Prerequisites: **CS2383** and **CS2333**.
CS 3983  Professional Practice  3 ch (3C) [W]
Covers social context of computing, professional and ethical responsibilities, risks and liabilities of computer-based systems, intellectual property, privacy and civil liberties, and professional certification by the Canadian Information Processing Society. Instructs students in the preparation of technical reports in Computer Science. Involves an independent study component resulting in a technical report, typically a survey paper. Covers basic writing, oral presentation and library skills. Prerequisites: 70 ch completed.

CS 4033  Software Project Management and Quality Assurance (A)  4 ch (3C 1T)
Introduces the general software life-cycle models and software processes. Discusses the "umbrella" activities in software development: project planning and monitoring, risk management, quality assurance through reviews and testing (including reliability and safety), configuration management. Prerequisite: CS 3033.

CS 4073  Software Processes Improvement (A)  4 ch (3C)
Discusses the identification of improvement opportunities, and verification of changes made to the process, through the use of process measurement and software metrics. Includes the analysis of past data for improving resource estimation. Prerequisites: CS 3033 and STAT2793.

CS 4083  Leading-Edge Technology in Software Development  4 ch (3C)
Selected topics at an advanced level. Content will vary. Potential topics: software evolution, formal methods, system engineering, program visualization. Prerequisites: CS 3033.

CS 4093  Team Software Development Project  4 ch (3C)
The application of sound software engineering techniques to a problem in a practical setting. This course involves a relatively large software project, done in a team (with proper team management). A real "client" shall be involved, from whom the requirements have to be gathered, and to whom quality product and documentation have to be delivered. This course is normally completed during the student's final year of study. Prerequisite: CS 3033 and permission of instructor.

CS 4103  Parallel Programming with MPI  4 ch (3C)
Explores the design and analysis of parallel algorithms on distributed and hybrid computing clusters. Development work on local and remote computing platforms with a high level computing language and message passing libraries such as OpenMP and MPI will provide the core of the course. Prerequisite: CS 3123.

CS 4113  Advanced Scientific Computing  4 ch (3C)
Topics to be discussed include: systems with banded, sparse, diagonally dominant, Toeplitz, positive definite or symmetric coefficient matrices. Methods of solution include both direct and iterative, factorization, perturbation, relaxation and projection. Additional topics may include
eigenvalue problems and nonlinear systems with applications taken from differential and integrro-differential equations. Prerequisites: CS 2113, CS 3113.

**CS 4123  Topics in High Performance Scientific Computing and Visualization** 4 ch (3C)  
Advanced level discussions chosen from current research topics in computation techniques, high-performance computing or visualization. The course will involve presentations and written reports. Prerequisites: Instructor permission and 90 ch completed.

**CS 4525  Database Management Systems II** 4 ch (3C 2L*)  
File systems and structures, advanced query languages, query optimization, concurrency control and recovery, security and integrity. Overview of non-relational database models. Prerequisites: INFO 1103, CS 3403, and 70 ch completed.

**CS 4613  Programming Languages** 4 ch (3C 1T)  
Structure and major characteristics of programming languages; formal definition, syntax, semantics. Comparative study of principal language concepts and their treatment in imperative, functional, logic, and object-oriented languages. Prerequisites: CS2333, CS2043 and 90 ch completed.

**CS 4713  Fundamentals of Simulation** 4 ch (3C 1T)  
Systems and model. The simulation process. Random number generation. Introduction to queues, computer modeling of discrete systems using appropriate languages, computer modeling of continuous systems, model validation and experiment planning. Case studies from a variety of disciplines. Prerequisites: CS 1083, CS 3113, STAT 3083.

**CS 4783  Web: Semantics, Services, and Solutions (O)** 4 ch (3C)  
This course outlines the World Wide Web and focuses on the technologies and innovations that are driving its evolution. It introduces the W3C endorsed Semantic Web technologies and looks at the migration of the syntactic web to the semantic web and subsequent generations. Key topics explored are knowledge engineering; OWL ontology reasoning; text mining and natural language processing tools; web services and workflow technology, as well as end-user interaction in web search. Prerequisite: CS1083 and CS2383. Highly recommended courses: INFO 1103, CS 3913 and MATH 3343.

**CS 4793  Fundamentals of Neural Networks (O)** 4 ch (3C)  
Introduction to the design and training of artificial neural networks, natural and artificial neurons, neural net architecture, single and multi-layered networks, supervised and unsupervised learning and their applications in time series analysis, optimization methods, solution of linear systems. Prerequisites: STAT 2793 or STAT 2593; MATH 2213; CS 3913; CS 2113 or permission of instructor.
CS 4843  Wireless and Mobile Computing (A)   4 ch (3C)
Wireless communication technology, fading and line-of-sight propagation, antennas, signal encoding, spread spectrum and wireless networking. Cellular system, cell coverage, mobile data communication, mobile IP and WAP. The course will also cover IEEE wireless standards, Bluetooth and other related topics for networking. Prerequisite: CS 3893.

CS 4893  Network Programming   4 ch (3C 2L*)
Threads, socket programming (client & server), secure sockets, multicast sockets, protocol handlers, content handlers, RMI, Mail API and social networks. Uses Java programming language. Prerequisites: CS 1083, CS 3893.

CS 4913  Theory of Computation   4 ch (3C)
Models of sequential and parallel computation, automata theory, formal languages, the Chomsky hierarchy, decidability and computability, sequential and parallel complexity theory. Prerequisites: CS 3913, CS 2333.

CS 4973  Independent Study in Computer Science   4 ch
This course will provide the student with practical experience in their area of study. Under the supervision of a faculty member, the student will explore topics not available in the regular course offerings. The course may contain written assignments, written tests, or relevant work experience. A written report and oral presentation are required. Students must identify a faculty member who is willing to supervise the course and apply to the co-ordinator of the course for approval prior to the term in which they wish to undertake the work. Applications are normally approved only for students who are in their final year of the programme, and who have obtained a grade point average of at least 3.0 in work of the second and third years. Prerequisite: Approval of the Department.

CS 4983  Technical Report   2 ch (2SC)
Builds on the skills developed in CS 3983, through the preparation and presentation of a technical report. A supervisor approved by the Department must normally be chosen before the beginning of the term. Prerequisite: CS 3983.

CS 4993  Honours Project   4 ch (2S)
The student submits a detailed proposal, schedule, progress reports and written report to the thesis coordinator with the supervisor's approval. A seminar is required. Planning of the thesis is done in the term prior to completion. Detailed guidelines are available from the Department. Prerequisite: CS 3983.
CS 4998 Directed Studies in Applied Computer Science  4 ch (3S)
This course permits students and faculty to explore inter-disciplinary areas of research in relation with computers in Arts, Science, and Business programs. In some cases, the faculty members will offer directed studies to groups of students. In other instances, individual students will seek this course on a one-on-one basis. Prerequisites: Approval of the CSAS department and at least 90 ch completed. Recommended that students have taken courses in CS or IT at 1xxxx/2xxxx level.

CS 4999 Directed Studies in Computer Science  4 ch (3S)
This course permits Computers Science students and faculty to explore various areas of Computer Science. In some cases, the faculty members will offer directed studies to groups of students. In other instances, individual students will seek this course on a one-on-one basis. Prerequisites: Department approval and at least 90 ch completed.

CS4403 Data Mining (O)  4 ch (3C 1L)
(Cross Listed: DA4403)

Prerequisites: STAT 2793 and INFO 1103.

CS 2617 C++ for Java Programmers  1 ch (2C)
Basic language constructs (input/output, variables and types, control structures), classes, pointers, and preprocessor. This course is given over an 8 week period as follows: 2 hours/week for 3 weeks followed by midterm test plus 2 hours/week for 3 weeks followed by final examination. Course drop date is one week after the midterm test. Prerequisite: CS 1083 or CS 2616, or equivalent.
Data Analysis

DA2503 Packaged Software Decision Aids 4 ch (3C 1T)
Examines typical software packages present in information centres and other business environments. Includes selected topics from the following areas: operating systems; network administration; communication software; wordprocessing; spreadsheets; database management systems and graphics.

Prerequisites: 30 ch of university courses including one of IT 1803, CS 1003, or CS 1073.

DA3053 Mathematical Software 4 ch (3C 1T)
Advanced software packages and programming languages developed for mathematical computations: symbolic, graphical, numerical and combinatorial. Students will be involved in implementing and testing various algorithms.

Prerequisites: Math 2003, Math 1703, or CS 1073.

DA3123 Numerical Treatment of Geometric Modeling 4 ch (3C 1T)
Presents the nature, development and application of the basic concepts of geometric modeling. The parametric geometry is considered primarily for curves including analytical properties, intersections and transformation. Emphasizes numerical methods and analysis with applications being drawn from such areas as image processing, graphics and computer-aided design.

Prerequisite: CS 3113.

DA3203 Data Analysis Using Statistical Software Packages 4 ch (3C)
This is a case-studies based course in which students learn to analyse data in a modern statistical computing environment. The course promotes the use of graphical and other exploratory techniques as a crucial first step in data analysis. Students will be exposed to practical problems often encountered during the data analysis process. The importance of summarizing and communicating results effectively will be emphasized through the strong project-oriented component of the course.

Prerequisite: 3 ch in each of three subjects: Mathematics, Statistics, and Computer Science.

DA4123 Numerical Solution of Systems 4 ch (3C 1T)
Emphasis on linear systems with discussion on topics such as large, small; sparse, full; square, nonsquare systems. Methods of solution involve a survey of direct and interactive techniques. As time permits, the discussions will be extended to include nonlinear systems. Applications drawn from statistics and operations research. Both writing computer programs and working with stored computer programs form an integral part of the course.
Prerequisites: CS 3113.

**DA4403 Data Mining (O)** 4 ch (3C 1L) (Cross Listed: CS4403)


Prerequisites: STAT 2793 and INFO 1103.

**DA4803 Independent Studies in Data Analysis** 4 ch (3C 1T)

Discussion of Data Analysis topics at an advanced level chosen jointly by student, advisor and Department Chair. Topic of course to be entered on the student’s transcript.

**DA4813 Independent Studies in Data Analysis** 4 ch (3C 1T)

Discussion of Data Analysis topics at an advanced level chosen jointly by student, advisor and Department Chair. Topic of course to be entered on the student’s transcript.

**DA4993 Project in Data Analysis** 4 ch (3C 1T)

Application of correct and appropriate methods of data analysis in one or more areas. A project proposal is required with a final report in which the student describes clearly and concisely the work done, the results obtained, and a careful interpretation of the results in form and language meaningful to workers in the subject area.

Prerequisite: Permission of Program Director.
BACHELOR OF SCIENCE IN COMPUTER SCIENCE

Department of Computer Science and Applied Statistics

General Office: Sir Douglas Hazen Hall, Room 305
Mailing Address: Department of Computer Science and Applied Statistics, University of New Brunswick,
100 Tucker Park Road,
Saint John, N. B.,
Canada, E2L 4L5
Phone: (506) 648-5970
Email: csas@unbsj.ca
Website: http://www.unbsj.ca/sase/csas/

FACULTY

Chair: Dr. Janet Light

- Baker, Christopher, BSc(New Castle-Upon-Tyne), PhD (Cardiff), Prof - 2008
- Belacel, Nabil, Adjunct Prof (Joint Appt: Faculty of CS UNBF) - 2003
- Garey, Lawrence E., BSc (St FX), MA, PhD (Dal), Prof Emeritus - 2007
- Gupta, Rameshwar D., BSc, MSc (Meerut), MA, PhD (Dal), Prof Emeritus - 2010
- Kaser, Owen, BCSS (Acad), MS, PhD (SUNY, Stony Brook), Assoc Prof - 1993
- Light, Janet, BEng (Madras), MEng (Bharathiar), PhD (Avinashilingam), Prof & Chair - 2002
- Lemire, Daniel, Adjunct Professor, (University of Quebec)- 2005
- Mahanti, Prabhat, BSc (Calic), MSc, PhD (Indian Inst. of Technology), Prof - 2001
- Shaw, Ruth, BScDA, MScCS, PhD (UNB), Prof, and Dean- 1986
- Stewart, Connie, BSc (UNB), MSc (Dal), PhD (Dal) Assoc Prof - 2004
- Tasse, Josee, BScCS (Montr.), PhD (McG.), Assoc Prof - 1997
- Zou, Liwen, BEng (BUU), MCS (Dal), PhD (Dal), Asst. Prof - 2013

General information

Curriculum:
The Department of Computer Science and Applied Statistics offers This is a four year undergraduate program accredited by the Canadian Information Processing Society (CIPS), leading to a Bachelor of Science in Computer Science (BScCS). Both honours and major specializations are also offered along with the BScCS program available through the three specializations. A set of core courses and some student selected courses (electives) comprise the requirements for the degree.

Our department also offers other related programs: Certificate programs in Computer Science and Data Analysis, as well as a CS Minor and an IT minor. A multi-disciplinary four year undergraduate program leading to a Bachelor in Information Sciences (BISc) is also available.

For general regulations on admission, please consult the appropriate section of the University calendar. Transfer into the BScCS from another UNB degree program is not permitted if the GPA for
the most recent assessment period is below 2.0. For transfer from another university, a CGPA equivalent to 2.0 at UNB is required.

**Regulations:**

1. The total curriculum consists of a minimum of 141 credit hours.
2. **For students admitted to the programme before May 2003, a grade of C or better is required for prerequisite programme courses. Students who fail to attain a C or better in such a course must repeat it until that grade level is attained. For students admitted to the programme in May 2003 or after, a grade of C or better is required in all required core courses, all courses offered for specializations or honours, and all CS courses.**
3. It is recommended to take a minimum of 12ch of courses having a significant writing component. **This requirement is mandatory for, if the student is contemplating a transfer into the Bachelor of Computer Science program at UNB Fredericton. Normally, courses with the prefix ENGL, HIST, or POLS satisfy this requirement. Other courses may also be acceptable. It is the responsibility of the student to ensure that a particular course has a significant writing component, by discussing with the instructor before taking the course. The student should also keep a course outline and at least one writing assignment, as a proof of the significant writing component.**

**Curriculum**

The basic degree curriculum consists of a set of core requirements plus elective courses. It is expected that students will take four (4) years of study at 5 term courses per term to complete the program. The specific requirements are listed below.

**Computer Science Core Requirements:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1003</td>
<td>Intro to Calculus I</td>
</tr>
<tr>
<td>MATH 1013</td>
<td>Intro to Calculus II</td>
</tr>
<tr>
<td>MATH 2213</td>
<td>Linear Algebra</td>
</tr>
<tr>
<td>or MATH 1503</td>
<td>Introduction to Linear Algebra</td>
</tr>
<tr>
<td>STAT 1793</td>
<td>Introduction to Probability and Statistics I</td>
</tr>
<tr>
<td>STAT 2793</td>
<td>Introduction to Probability and Statistics II</td>
</tr>
<tr>
<td>CS 1073</td>
<td>Intro to Computer Programming I (in Java)</td>
</tr>
<tr>
<td>CS 1083</td>
<td>Intro to Computer Programming II (in Java)</td>
</tr>
<tr>
<td>CS 1303</td>
<td>Discrete Structures</td>
</tr>
<tr>
<td>CS 2043</td>
<td>Software Engineering I</td>
</tr>
<tr>
<td>CS 2253</td>
<td>Machine Level Programming</td>
</tr>
<tr>
<td>CS 2333</td>
<td>Computability and Formal Languages</td>
</tr>
<tr>
<td>CS 2383</td>
<td>Data Structures and Algorithms</td>
</tr>
<tr>
<td>CS 3403</td>
<td>Operating Systems</td>
</tr>
<tr>
<td>CS 3813</td>
<td>Computer Architecture and Organization</td>
</tr>
<tr>
<td>CS 3913</td>
<td>Algorithmics</td>
</tr>
<tr>
<td>CS 3983</td>
<td>Professional Practice</td>
</tr>
<tr>
<td>CS 4613</td>
<td>Programming Languages</td>
</tr>
<tr>
<td>CS 4983</td>
<td>Technical Report or CS 4993 (Honours Project)</td>
</tr>
</tbody>
</table>
ECE 2213 or CS2803
Digital Systems
Logic Design
INFO1103
Data and Information Management

At least one of:
CS 3033
Software Design and Development
CS 3113
Introduction to Numerical Methods
CS 3123
High-Speed Computing
CS 3893
Computer Networking

At least two of:
CS 4033
Software Project Management and Quality Assurance
CS 4073
Software Process Improvement
CS 4083
Leading-Edge Technology in Software Development
CS 4093
Team Software Development Project
CS 4103
Parallel Programming with MPI
CS 4113
Advanced Scientific Computing
CS 4123
Topics in High-Performance Scientific Computing and Visualization
CS 4525
Database Management Systems II
CS 4843
Wireless and Mobile Computing
CS 4893
Network Programming
CS 4913
Theory of Computation

Mathematics and Statistics Core Requirements:

MATH 1003
Intro to Calculus I
MATH 1013
Intro to Calculus II
MATH 2213
Linear Algebra
or MATH 1503 Introduction to Linear Algebra

STAT 1793
Introduction to Probability and Statistics I
STAT 2793
Introduction to Probability and Statistics II

Also, At least one three credit hour upper-level MATH/STAT elective is required. MATH 3633 (Fundamental Principles of School Mathematics) cannot be used to satisfy this requirement, as it cannot be taken for credit by Computer Science students.

Breadth Core Requirements:

Students should complete at least 30ch of approved courses (representing approx. 10 courses) from the areas of Arts, Business Administration, Engineering, and Science. MATH, STAT and SWE courses are not eligible for this requirement. Courses from other areas, as well as selected ECE courses (Electrical Engineering courses, not Computer Engineering courses), may be taken toward this requirement with prior approval from the Department Chair.

At least 6ch of these (2 courses) must be at the 2000 level or above.
It is strongly recommended that in order to meet this requirement, the student takes half of these courses in Science, Engineering, and/or Business, and half of these courses in Humanities and Social Sciences. Note that Honours students have to include Science courses, as described below.

The following courses cannot be used toward this breadth requirement, because of their heavy statistics content: BA 1605, BA 2606, BA 3129, ECON 4645, PSYC 2102, PSYC 2901, PSYC 3913, SOCI 3104.

**Free Electives:**

In addition to the courses taken to satisfy the core curriculum requirements, BScCS students must complete at least 24 ch approved free electives (22ch if CS4993 is chosen in lieu of CS4983) to get a total of 141 ch. Students can choose combinations of electives to allow them to complete an area of specialization with the BScCS degree, to complete a Minor in another area, or simply to acquire more breadth in their studies. Students are encouraged to take one course (or more) in a newer area of computing.

**Areas of Specialization:**

The basic degree is obtained by satisfying the basic curriculum outlined above. In addition to the basic degree, three specializations or curriculum options are available, as described below:

1. Specialization in High-Performance Scientific Computing
2. Specialization in Software Engineering, and
3. Specialization in Networking

To obtain a specialized degree, students must complete all required core courses and all required courses listed in the chosen area of specialization, and they must obtain a cumulative grade point average of 2.5 or greater.

**SPECIALIZATION IN HIGH-PERFORMANCE SCIENTIFIC COMPUTING**

**Note:** Admission to this specialization has been suspended.

**Required Courses**

- **CS 3113** Introduction to Numerical Methods
- **CS 3123** High-Speed Computing
- **CS 4103** Parallel Programming with MPI
- **CS 4113** Advanced Scientific Computing
- **CS 4123** Topics in High-Performance Scientific Computing and Visualization

**SPECIALIZATION IN SOFTWARE ENGINEERING**

**Required Courses**

- **CS 3033** Software Design and Development
- **CS 4525** Database Management Systems II
In addition, at least three (3) of the following four (4) courses must be completed.

- CS 4033 Software Project Management and Quality Assurance
- CS 4073 Software Process Improvement
- CS 4083 Leading-Edge Technology in Software Development
- CS 4093 Team Software Development Project

NOTE: The Specialization in Software Engineering is not an accredited engineering program and does not lead to registration as a Professional Engineer.

SPECIALIZATION IN NETWORKING

Required Courses

- CS 3893 Computer Networking
- CS 4843 Wireless and Mobile Computing

In addition, at least three (3) of the following four (4) courses must be completed.

- MATH 3343 Networks and Graphs
- CS 3123 High Speed Computing
- CS 4893 Network Programming
- CS 4713 Fundamentals of Simulation

Honours Degree Curriculum, Basic and Specialized:

Students in the BScCS degree programme may elect, after their first or second year, an Honours degree programme, with or without a specialization. Students who satisfy the requirements for an honours and/or specialized degree will have that designation on their final transcript. The honours degrees are designed to prepare students for graduate work.

The requirements for the basic BScCS degree must be met. Within the constraints of those basic requirements, the student must complete:

- A full-year course sequence in Science that includes labs, as part of the breadth core requirements:
  - BIOL 1105 / BIOL 1205 / BIOL 1017
  - or CHEM 1041 / CHEM 1046 / CHEM 1072 / CHEM 1077
  - or GEOL 1044 / GEOL 1074
  - or PHYS 1011 / PHYS 1012 / PHYS1021 / PHYS 1022
  - or a Science sequence as approved by the Department.
- CS 3xxx or CS 4xxx (4ch) An extra upper-level CS elective, excluding CS3403, CS 3813, CS3913, CS 4613, and CS 4993
- CS 4xxx (4ch) An extra fourth year CS elective, excluding CS 4613 and CS 4993.
- One CS topics course, covering an emerging area of computer science or recent advances in one area. Such course can be one of: CS4083, CS 4123, CS4973, or CS4999. The Department Chair must approve the topic chosen.
- CS 4993 with a grade of B or better, in lieu of CS 4983.
An honours degree with specialization requires that the student meet the requirements of both the honours degree and the specialization. It further requires:

- **Honours in High-Performance Scientific Computing**: STAT 3083 and STAT 3093.
- **Honours in Software Engineering**: STAT 3703.
- **Honours in Networking**: no additional courses required

A cumulative grade point average greater than or equal to 3.0 is required to achieve the honours degree. Students who satisfy the requirements for an Honours degree will receive “First Class Honours” if their CGPAs are greater than or equal to 3.5. If their CGPAs are greater than or equal to 3.0 and less than 3.5, they will receive “Second Class Honours”.

**Certificate in Computing**

This certificate programme is designed to provide individuals, especially working adults, with an opportunity to acquire the formal background necessary to become effective participants in the Information Technology Industry. Since the courses taken in the Certificate are also appropriate for the BScCS, students who later decide to pursue a BScCS will normally be able to transfer their credits into that programme.

Although the scheduling of courses cannot be guaranteed, it is likely that the Certificate can be completed on a part-time basis in five terms.

The Certificate is also available to students who do not meet the entrance requirements of the BScCS program; in fact, there are no specific entrance requirements except the formal approval of the Department of Computer Science & Applied Statistics. However, students who do not have Grade 12 Math will have to pass Math 1863 before they take the required CS courses.

**Core Courses**

- **CS 1073** Intro to Computer Programming I (in Java)
- **CS 1083** Intro to Computer Programming II (in Java)
- **CS 1303** Discrete Structures
- **CS 2043** Software Engineering I
- **INFO 1103** Data and Information Management
- **CS 2383** Data Structures and Algorithms
- **CS 2998** Programming Project
- **ICS 1002** Foundations of Information and Communication Studies

**Electives**: (At least 12 ch required)

Electives may be chosen from any of the 2000-, 3000-, or 4000-level Computer Science courses.

A grade of C or better is required in all courses credited toward the Certificate.

**CS Minor**

This program aims to prepare graduates from other disciplines to a career in areas of arts and business computer applications, such as in media, banking, data analyzing etc. There are potentially many rich opportunities for cooperation between the knowledge of arts and business disciplines with computer science for the above career.

**Prerequisites**
Grade 12 High School Math

**Required courses**
- **CS 1073** Intro to Computer Programming I (in Java)
- **CS 1083** Intro to Computer Programming II (in Java)
- **CS 1303** Discrete Structures
- **CS 2043** Software Engineering I
- **CS 2253** Machine Level Programming
- **CS 2383** Data Structures and Algorithms
- **INFO 1103** Data and Information Management

Additional 4 ch from upper level CS courses (CS2998 can be used to meet this requirement).

CS credits required = 32 ch min

**Note:** A grade of C or better is required in all courses credited towards the minor in CS.

**IT Minor**

In the last few years information technology (IT) has emerged to play an important role in a wide range of settings, most work environments. Organizations of all kinds have become more dependent on computing infrastructure than before. IT people are required to select, manage, and maintain IT infrastructure to meet organizational needs. This program aims to prepare graduates from other discipline to a career in IT.

**Prerequisites**
None. However, students who do not have NB Grade 12 Math will have to pass Math 1863 before they take the required CS courses (or permission of instructor).

**Required courses**
- **IT 1713** Multimedia and Information Highway
- **IT 1813** Introduction to Data Management
- **IT 2773** Java programming for the Internet
- **OR**
- **CS 1073** Intro to Computer Programming I (in Java)
- **CS 1083** Intro to Computer Programming II (in Java)
- **CS 2043** Software Engineering I
- **INFO 1103** Data and Information Management

Additional 8 ch from upper level courses in CS/IT (or CS2998 + 4ch from upper level courses in CS/IT).
Total CS/IT credits required = 29 ch min

**Note:** A grade of C or better is required in all courses credited towards the minor in IT.