

## MEETING OF THE FACULTY COUNCIL OF THE FACULTY OF SCIENCE

A regular meeting of the Faculty Council of the Faculty of Science will be held on Wednesday, April 18, 2018 at 1 p.m. in C-2004.

### AGENDA

1. **Regrets**
2. **Adoption of the Minutes of March 21, 2018**
3. **Business Arising from the Minutes:** None
4. **Correspondence:** None
5. **Reports of Standing Committees:**
  - A. **Undergraduate Studies Committee:**
    - a. Department of Biology, paper 5.A.a (Pages 6-36)
      - i) Calendar change to Existing Course: BIOL 4405
      - ii) Calendar change to Existing Programs: Biology Cooperative Programs
      - iii) Calendar change to Existing Programs: Chemistry requirements for the Biology Major and Honours Programs
    - b. Department of Chemistry, paper 5.A.b (Pages 37-59)
      - i) Deletion of CHEM 1011
      - ii) Deletion of CHEM 2440
    - c. Department of Ocean Sciences, paper 5.A.c (Pages 60-80)
      - i) Calendar Changes to Existing Course: OCSC 2500
      - ii) New Special Topics Course - OCSC 4940
  - B. **Graduate Studies Committee:**
    - a. Department of Ocean Sciences requesting OCSC 7500-OCSC 7515 for special topic courses, paper 5.B.a (Pages 81)
    - b. Calendar change to Existing Programme: Master of Applied Statistics Programme, paper 5.B.b (Pages 82-109)
    - c. Calendar Change to Course Requirement: PSYC 6001, paper 5.B.c (Pages 110-111)
    - d. Department of Psychology, special topics course, PSYC 6118, Substance Abuse and Behavioural Addictions in Youth, for information, paper 5.B.d (Pages 112-115)
  - C. **Nominating Committee:** None
  - D. **Library Committee:** None
6. **Report of Teaching Consultant**
7. **Reports of Delegates from Other Councils**
8. **Report of the Dean**
9. **Question Period**
10. **Adjournment**



Mary L. Courage, Ph.D.  
Interim Dean of Science



## Faculty of Science

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### FACULTY OF SCIENCE FACULTY COUNCIL OF SCIENCE MINUTES OF MEETING OF MARCH 21, 2018

A meeting of the Faculty Council of the Faculty of Science was held on Wednesday, March 21, at 1:00 p.m. in room C-2045.

#### FSC 2579

#### Present

#### Biochemistry

Berry, M.

#### Biology

Jones, I.            Staveley, B.

#### Chemistry

Kerton, F.        Kozak, C.

#### Computer Science

Batten, D.        Bungay, S.                    Chen, P.            Gong, M.

#### Earth Sciences

Hanchar, J.        Welford, K.

#### Mathematics & Statistics

Loredo-Osti, J.        Pike, D.            Radford, C.        Sullivan, S.

#### Ocean Sciences

Fletcher, G.

#### Physics & Physical Oceanography

Evstigneev, M.        Lagowski, J.        Morrow, M.        Poduska, K.

#### Psychology

Neath, I.            Thorpe, C.

#### Dean of Science Office

Foss, K.            Jackson, G.        MacKenzie, T.        Foster, A.

## **Geography**

Edinger, E.

## **Registrar's Office**

Edmunds, T.

## **Marine Institute**

Caines, S.

**FSC 2580**

### **Regrets**

Catto, N.      Mantyka, S.      Todd, A.      Zedel, L.

**FSC 2581**

### **Adoption of Minutes**

**Moved:** Minutes of December 6, 2017, meeting be adopted (Sullivan/Evstigneev).  
**One Abstention. Carried.**

**Moved:** Minutes of January 17, 2018, meeting be adopted (Sullivan/Loredo-Osti).  
**One Abstention. Carried.**

**FSC 2582**

**Business Arising:** None

**FSC 2583**

**Correspondence:** None

**FSC 2584**

### **Reports of Standing Committees:**

#### **A. Undergraduate Studies Committee:**

Report presented by Shannon Sullivan, Chair, Undergraduate Studies Committee

a) i) **Moved:** Department of Computer Science, calendar change to existing regulations, 10.4.7 Computer Industry Internship Option (CIIO) (Sullivan/Bungay). **Carried.**

ii) **Moved:** Department of Computer Science, calendar change, COMP 2718 (Sullivan/Bungay). **Carried.**

iii) **Moved:** Department of Computer Science, calendar change, COMP 2002, 2003 and 3754 (Sullivan/Bungay). **Carried.**

iv) **Moved:** Department of Computer Science, calendar change, ENGI 8814/COMP 4301 (Sullivan/Bungay). **Carried.**

#### **B. Graduate Studies Committee:**

Report presented by J.C. Loredo-Osti, Chair, Graduate Studies Committee:

a) Computer Science, special topics course, COMP 6919, Sensing with Mobile Devices, presented to council for information purposes only.

- b) Physics and Physical Oceanography, special topics course, PHYS 6819, Introduction to Quantum Field theory, presented to council for information purposes only.
- c) J.C. Lored-Osti, Chair, Graduate Studies Committee, presented feedback from the Graduate Studies Committee concerning the proposed revisions of Calendar SGS Regulations 4.8 and 4.10.

**Motion:** To accept the feedback of the Graduate Studies Committee as presented to Faculty Council as the Faculty of Science feedback, which does not accept in full the proposed revisions of the Calendar SGS regulations 4.8 and 4.10. (Lored-Osti/Radford). **One Abstention. Carried.**

**C. Nominating Committee:** None

**D. Library Committee:**

Report presented by Mykhalo Evsitgneev, Chair, Library Committee

The Library has adopted a new strategic plan and it will be posted on their website within the month. They are in the process of finalizing their budget for next fiscal year; over the past year the library had to cancel journals but the budget looks good for 2018-19 and they do not anticipate any cancelations this year.

**FSC 2585 Report of Teaching Consultant:** None

**FSC 2586 Reports of Delegates from Other Councils:** None

**FSC 2587 Report of the Dean:**

We are currently awaiting the next provincial budget which will be released on March 27, 2018 and we are hoping there will not be any further cuts to Memorial University.

**FSC 2588 Question Period:**

**FSC 2589 Adjournment**

The meeting adjourned at 1:25 p.m.



**Office of the Registrar**

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**April 11, 2018**

TO: All Members of Faculty Council, Faculty of Science

FROM: Tracey Edmunds, Secretary, Committee on Undergraduate Studies  
Faculty of Science (Acting)

SUBJECT: **Proposals for Calendar Changes**

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At a meeting held on March 27, 2018, the Faculty of Science Committee on Undergraduate Studies agreed that the following items should be forwarded to Faculty Council for approval:

**1. Department of Biology**

- (a) Calendar Changes to Existing Course - Biology 4405
- (b) Calendar Changes to Existing Programs - Biology Cooperative Programs
- (c) Calendar Changes to Existing Programs - Chemistry requirements for the Biology Major and Honours Programs

**2. Department of Chemistry**

- (a) Deletion of Chemistry 1011
- (b) Deletion of Chemistry 2440

**3. Department of Ocean Sciences**

- (a) Calendar Changes to Existing Course - Ocean Sciences 2500
- (b) New Special Topics Course - Ocean Sciences 4940

*Tracey Edmunds*

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Tracey Edmunds

# Proposal

## Calendar Change(s) to Existing Course(s)

### Executive Summary

Biology 4405 (Landscape Ecology) is an introduction to the theory and principles of landscape pattern and processes, including issues related to scale, networks, landform and vegetation patterns, species distributions, and natural and human-caused aspects of landscape change.

It is proposed that the laboratory component for Biology 4405 be removed.

### Resource Implications: Instructional Costs

There are no new resource implications as this course is taught annually by existing Faculty.

### Consultations

Faculties of Humanities and Social Sciences, Biochemistry, Business, Education, Engineering, Human Kinetics and Recreation, Medicine, Music, Nursing, Pharmacy, Science and Social Work; Grenfell Campus; Marine Institute and MUN Library.

### Library Holdings and/or Other Resources Required

No new library resources or costs are required or anticipated.

Signature of Unit Head (if appropriate):

Date:

Signature of Dean/Associate Vice-President (Academic)/Vice-President:

Date:

## SUMMARY PAGE FOR SENATE

### Approval Form

#### Biology 4405

#### Landscape Ecology

#### Calendar Change(s) - See attached

#### 11.2 Biology

#### 4405

**Landscape Ecology** is an introduction to the theory and principles of landscape pattern and processes, including issues related to scale, networks, landform and vegetation patterns, species distributions, and natural and human-caused aspects of landscape change.

CO: Statistics 2550 or equivalent

~~LC: either three hours of lecture and three hours of laboratory per week or a two-week intensive course that embodies equivalent instructional time~~

~~LH: either three hours of lecture and three hours of laboratory per week or a two-week intensive course that embodies equivalent instructional time~~

~~LH: 3~~

PR: Science 1807; BIOL 2600 and 18 credit hours in Biology; Statistics 2550 or equivalent, or permission from the course instructor

#### Secondary Calendar Changes

None.

#### Calendar Entry After Changes

#### 11.2 Biology

#### 4405

**Landscape Ecology** is an introduction to the theory and principles of landscape pattern and processes, including issues related to scale, networks, landform and vegetation patterns, species distributions, and natural and human-caused aspects of landscape change.

CO: Statistics 2550 or equivalent

PR: Science 1807; BIOL 2600 and 18 credit hours in Biology; Statistics 2550 or equivalent, or permission from the course instructor

#### Rationale

Biology 4405 (Landscape Ecology) is an introduction to the theory and principles of landscape pattern and processes, including issues related to scale, networks, landform and vegetation patterns, species distributions, and natural and human-caused aspects of landscape change.

The structure of the lecture component is a combination of lectures and small seminar discussions of relevant peer-reviewed articles. Students are highly engaged with the subject

matter through the seminar discussion component.

The laboratory portion of BIOL 4405 focuses on meaningful, yet feasible Geographic Information System (GIS) and spatial modelling exercises. These exercises take significant resources to execute and the associated software is updated by the manufacturer frequently, making it difficult to maintain up to date lab exercises. As a result, it is difficult to provide students with a solid computational foundation in GIS and spatial analysis. At best, students are exposed to the tools and software used in the study of landscape ecology with the opportunity for some hands-on experience to help illustrate lecture material.

Removing the laboratory component for Biology 4405 would allow 1) for resources to be re-allocated to the lecture component and enhance the seminar discussion component and 2) explore the development of an undergraduate course in Conservation Biology GIS to provide a more complete foundation for students in GIS and spatial analysis.

### **Consultations Sought From**

Biochemistry  
 Business  
 Education  
 Engineering  
 Grenfell Campus  
 Human Kinetics and Recreation  
 Humanities and Social Sciences  
 Marine Institute  
 Medicine  
 Music  
 Nursing  
 Ocean Science  
 Pharmacy  
 Science  
 Social Work

### **Comments Received**

### **Library Report Received**



**Signature: Dean, Associate Vice-President (Academic) or Vice-President**

Name \_\_\_\_\_

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**FOR OFFICE USE ONLY**

**APPROVAL GRANTED BY SENATE COMMITTEE ON UNDERGRADUATE STUDIES**

Chair: \_\_\_\_\_

Secretary: \_\_\_\_\_

Date: \_\_\_\_\_

Appendix 1: Proof of Consultation

# Proposal Calendar Change(s) to Existing Program(s)

**Executive Summary**

The Department of Biology would like to amend the regulation for the Biology Cooperative Program to accurately reflect current practices.

**Resource Implications: Instructional Costs**

No new resources are required. There are no changes to the course content.

**Consultations**

The internal distribution list for Calendar changes.

**Library Holdings and/or Other Resources Required**

No new library resources or costs are required or anticipated.

Signature of Unit Head (if appropriate): \_\_\_\_\_

Date: \_\_\_\_\_

Signature of Dean/Associate Vice-President (Academic)/Vice-President:

\_\_\_\_\_

Date: \_\_\_\_\_

## SUMMARY PAGE FOR SENATE

### Approval Form

Major (Co-operative), Honours (Co-operative) in Biology  
 Major (Co-operative), Honours (Co-operative) in Biology (Cell & Molecular)  
 Major (Co-operative), Honours (Co-operative) in Biology (Ecology & Conservation)  
 Honours (Co-operative) in Biology (Marine)

Calendar Change(s) - See attached

#### 10.2.3.5 Major in Biology (Co-operative) Program (BCOP)

This program is available to full-time Biology majors only.

The Biology (Co-operative) Program (BCOP) provides an opportunity for students to learn valuable practical skills while working in fields related to Biology. Students complete three Work Terms, which consist of full-time paid employment in the field of Biology of at least 12 weeks in duration. The timing of the Work Terms is such that employers stand to gain from the acquired skills of biology majors in training. The objectives of the Work Term component of the BCOP are embodied in the Work Term descriptions found at the end of the Faculty of Science section under Course Descriptions, Biology, [Work Term Descriptions](#).

##### 1. Admission Requirements

- Admission is limited, competitive, and selective.
- The primary ~~critereion~~ criteria used in reaching decisions on applications for admission ~~is~~ are motivation and overall academic achievement.
- A student must first be admitted to the Biology Major.
- Application deadline: ~~November~~ October 15 for the following Spring semester work term (normally the third semester in year two).
- To be ~~admitted to the program~~ eligible for admission, a student must have completed the second year Biology Core, with an overall average of at least 65%, and an overall average of at least 65% in all Biology courses. A student must have an overall average of 65% in all other required courses, and must be registered ~~for 15 credit hours~~ as a full-time student in the semester in which application is made.

##### 2. Program of Study

- In addition to the requirements below, a student must fulfill all requirements for one of a Major in Biology; Major in Biology (Cell and Molecular); Major in Biology (Ecology and Conservation); Honours in Biology; Honours in Biology (Cell and Molecular); Honours in Biology (Ecology and Conservation); or Honours in Biology (Marine).
- Students' status in the program is assessed at the end of each semester. To remain in BCOP, a student must receive a passing grade in all required courses, and must maintain an overall average of at least 65% in all Biology courses and an overall average of at least 65% in all courses, including electives. A student who fails a required course, fails to maintain an overall average of 65% in Biology courses, or fails to maintain an overall average of 65%, will be required to withdraw from BCOP. The student in question may apply for readmission in a subsequent year after passing the specified required course(s) previously failed, or re-establishing the required average.
- A student is required to complete three work terms, one of which ~~must~~ will normally be either in the Fall or Winter semester.

##### 3. Work Term Placement

- General management of the ~~work terms~~ in BCOP is the responsibility of the designated Academic Staff Member in Co-operative Education (ASM-CE). ~~ASM-CEs Co-operative Education is~~ are responsible for facilitating the engagement of assisting potential

- employers to become involved in the program, organizing competitions for Work Term employment, arranging student-employer job interviews and facilities, managing the co-op data base management, and developing employment opportunities and monitoring students during the work term. for the continual development of employment opportunities. Co-operative Education will work with the Biology Co-op Liaison to counsel students, visit students on work assignments and evaluate the work term.
- b. Students are ultimately responsible for securing their work term placements. ASM-CEs provide support for the job search and inform students of potential opportunities. Work-placement is not guaranteed but every effort is made to ensure that appropriate employment is made available. In the case of students who are required to withdraw from the program, Co-operative Education has no responsibility for placement until they have been readmitted to the program.
  - c. A student who is admitted to the co-op program gives permission to the University to provide a copy of the applicant's resume, university transcript and work term evaluations to potential employers.
  - d. A student who has been accepted to BCOP may independently obtain a work term placement in consultation with the ASM-CE. Such employment positions must satisfy the criteria for work terms, be confirmed in writing by the employer and be approved by the ASM-CE before the first day of the work term according to the University Diary. may obtain his/her own work term placement outside the competition. Such employment positions must be confirmed by the employer, and must be approved by the DCE coordinator and the Biology Department Liaison Cooperative Education.
  - e. Within a month after starting a Work Term, a student must submit a proposal for the work term report.
  - f. Salaries paid to co-operative students are determined by employers based on their internal wage structures.

#### 4. Registration and Evaluation of Performance

- a. In Work Terms I, II, and III, a student must register for Biology 199W, 299W, and 399W respectively.
- b. ~~Student performance evaluations are to be completed by the employer and returned to Co-operative Education.~~ The Work Term evaluations shall consist of two components:
  - i. On-the-job Student Performance:
 

Job performance shall be assessed by Co-operative Education in consultation with the department using information gathered during the Work Term and input from the employer towards the end of the Work Term. Formal written documentation from the employer shall be sought. Evaluation of the job performance will result in one of the following classifications: OUTSTANDING, ABOVE EXPECTATIONS, SATISFACTORY, MARGINAL PASS, FAIL.
  - ii. The Work Report Assignment(s):
    - A student is required to submit a Work Term report one or more assignment(s) to Co-operative Education as outlined in the course syllabus. on the first day of final exams in the semester of the Work Term.
    - Work Term reports Assignments(s) shall be are evaluated by a faculty member and an ASM-CE Co-operative Education.
    - If an employer designates a report to be of a confidential nature, both employer and Co-operative Education must agree as to the methods to protect the confidentiality of such a report before the report may be accepted for evaluation.
    - Reports must contain original work related to the Work Term placement. The topic must relate to the work experience and will be chosen by the student in consultation with the employer. The topic must be approved by the coordinator and the Biology Co-op Liaison.

Evaluation of the work term assignment(s) will result in one of the following classifications: OUTSTANDING, ABOVE EXPECTATIONS, SATISFACTORY, MARGINAL PASS, FAIL.

The evaluation of the job performance and the ~~work term report~~ assignment(s) are recorded separately on the transcript. Overall evaluation of the work term will result in one of the following final grades being awarded:

- Pass with Distinction: Indicates OUTSTANDING PERFORMANCE in both the ~~work term report~~ assignment(s) and the job performance.
  - Pass: Indicates that PERFORMANCE MEETS EXPECTATIONS in both the ~~work term report~~ assignment(s) and the job performance.
  - Fail: Indicates FAILING PERFORMANCE in the ~~work term report~~ assignment(s) or the job performance, or both. To remain in BCOP, a student must obtain a final grade of Pass or higher.
- c. If a student fails to achieve the Work Term standards specified above, the student will be required to withdraw from BCOP. Such a student may reapply to the program, at which time the student will be required to repeat the Work Term with satisfactory performance. Only one Work Term may be repeated in the entire program.
  - d. ~~In order to be considered for readmission, a student must formally apply for readmission to the program not later than the deadline date outlined under [Admission Requirements](#) above.~~
  - e. A student who withdraws from a Work Term without acceptable cause subsequent to a job placement will be required to withdraw permanently from BCOP.
  - f. A student who drops a Work Term without prior approval from both Co-operative Education and the Biology Co-op Liaison, or who fails to honour an agreement to work with an employer, or conducts him/herself in such a manner as to cause the discharge from the job, will be awarded an overall grade of FAIL for the Work Term in question and will be required to withdraw permanently from BCOP.
  - g. Permission to drop a Work Term does not constitute a waiver of degree requirements, and a student who has obtained such permission must complete an approved Work Term in lieu of the one dropped.

## 10.2.9 Honours in Biology (Co-operative)

### 10.2.9.1 Admission Requirements

See **Major in Biology (Co-operative)**.

### 10.2.9.2 Program of Study

1. In addition to the requirements below, a student must fulfill all requirements for either an Honours in Biology, Honours in Biology (Cell and Molecular), Honours in Biology (Ecology and Conservation), or Honours in Biology (Marine) as described under each specific program.
2. To remain in BCOP Honours, a student must receive a passing grade in all required courses, and must maintain an average of at least 65% in all Biology courses and an overall average of at least 70% in all courses, including electives.
3. A student is required to complete three work terms, one of which ~~must~~ will normally be either in the Fall or Winter semester.

## 11.2.1 Work Term Descriptions

The following Work Terms are a requirement of the Biology (Co-operative) Program (BCOP) only.

**199W Work Term I** follows the successful completion of Semester 4. Students are expected to learn, develop and practice the high standards of behaviour and performance normally expected in the work

environment. Students will observe, apply, analyse and/or evaluate concepts from Biology courses in the workplace and further their understanding of the principles of biology and how they are applied in a professional setting.

~~(A detailed description of each job is normally posted during the job competition.)~~

~~As one component of the Work Term, the student is required to complete a work report. The work report, as a minimum requirement should~~

~~analyse an issue/problem related to the student's work environment.~~

- ~~1. demonstrate an understanding of the structure of a professional report, and show reasonable competence in written communication and presentation skills. (Students should consult the evaluation form provided in the placement package.)~~

~~Late reports will be graded as FAIL unless prior permission for a late report has been given by Co-operative Education.~~

~~Seminars on professional development, conducted by Co-operative Education, are presented during Semester 4 to introduce and prepare the student for participation in the subsequent work terms.~~

~~Topics may include, among others, work term evaluation, work report writing, career planning, employment seeking skills, resume preparation, self employment, ethics and professional concepts, behavioural requirements in the work place, assertiveness in the work place and industrial safety.~~

CH: 0

LC: 0

PR: Admission to the Biology Major and successful completion of semester 4

## **299W**

### **Work Term II**

follows the successful completion of Semester 6. Students are expected to further develop and expand their knowledge and work-related skills and should be able to accept increased responsibility and challenge. In addition, students are expected to demonstrate an ability to deal with increasingly complex work-related concepts and problems. Students will continue to observe, apply, analyse and/or evaluate concepts from biology courses in the workplace and continue to further their understanding of the principles of Biology and how they are applied in a professional setting. Students are required to complete one or more assignments, as outlined in the syllabus. ~~The work report, as a minimum requirement should~~

- ~~1. analyze an issue/problem related to the student's work environment and demonstrate an understanding of practical application of concepts relative to the student's academic background~~
- ~~2. demonstrate competence in creating a professional report, and~~
- ~~3. show competence in written communication and presentation skills. Late reports will be graded as FAIL unless prior permission for a late report has been given by Co-operative Education.~~

CH: 0

LC: 0

PR: ~~admission to the Biology Major and successful completion of semester 6~~ BIOL 199W

## **399W**

### **Work Term III**

follows the successful completion of semester 7 or Work Term II. Students ~~should~~ will have sufficient academic grounding and work experience to contribute in a positive manner to the problem-solving and management processes needed and practiced in the work environment. Students should become better acquainted with their discipline of study, should observe and appreciate the attitudes, responsibilities, and ethics normally expected of professionals and should exercise greater independence and responsibility in their assigned work functions.

The work report should reflect the growing professional development of the student and, as a minimum requirement, will

- ~~1. demonstrate an increased ability to analyse a significant issue/problem related to the student's~~

experience in the work environment

2. demonstrate a high level of competence in producing a professional report, and

3. show a high level of competence in written communication and presentation skills.

Late reports will be graded as FAIL unless prior permission for a late report has been given by Co-operative Education:

CH: 0

LC: 0

PR: admission to the ~~Biology Major~~ and successful completion of semester 7 or Work Term II BIOL 299W

## Secondary Calendar Changes

None.

## Calendar Entry After Changes

### 10.2.3.5 Major in Biology (Co-operative) Program (BCOP)

This program is available to full-time Biology majors only.

The Biology (Co-operative) Program (BCOP) provides an opportunity for students to learn valuable practical skills while working in fields related to Biology. Students complete three Work Terms, which consist of full-time paid employment in the field of Biology of at least 12 weeks in duration. The timing of the Work Terms is such that employers stand to gain from the acquired skills of biology majors in training. The objectives of the Work Term component of the BCOP are embodied in the Work Term descriptions found at the end of the Faculty of Science section under Course Descriptions, Biology, [Work Term Descriptions](#).

#### 5. Admission Requirements

- a. Admission is limited, competitive, and selective.
- b. The primary criteria used in reaching decisions on applications for admission are motivation and overall academic achievement.
- c. A student must first be admitted to the Biology Major.
- d. Application deadline: October 15 for the following Spring semester work term (normally the third semester in year two).
- e. To be eligible for admission, a student must have completed the second year Biology Core, with an overall average of at least 65%, and an overall average of at least 65% in all Biology courses. A student must have an overall average of 65% in all other required courses, and must be registered as a full-time student in the semester in which application is made.

#### 6. Program of Study

- a. In addition to the requirements below, a student must fulfill all requirements for one of a Major in Biology; Major in Biology (Cell and Molecular); Major in Biology (Ecology and Conservation); Honours in Biology; Honours in Biology (Cell and Molecular); Honours in Biology (Ecology and Conservation); or Honours in Biology (Marine).
- b. Students' status in the program is assessed at the end of each semester. To remain in BCOP, a student must receive a passing grade in all required courses, and must maintain an overall average of at least 65% in all Biology courses and an overall average of at least 65% in all courses, including electives. A student who fails a required course, fails to maintain an overall average of 65% in Biology courses, or fails to maintain an overall average of 65%, will be required to withdraw from BCOP. The student in question may apply for readmission in a subsequent year after passing the specified required course(s) previously failed, or re-establishing the required average.



- c. A student is required to complete three work terms, one of which will normally be either in the Fall or Winter semester.

## 7. Work Term Placement

- a. General management of the BCOP is the responsibility of the designated Academic Staff Member in Co-operative Education (ASM-CE). ASM-CEs are responsible for facilitating the engagement of potential employers in the program, organizing competitions for Work Term employment, arranging job interviews and facilities, managing the co-op data base, and developing employment opportunities and monitoring students during the work term.
- b. Students are ultimately responsible for securing their work term placements. ASM-CEs provide support for the job search and inform students of potential opportunities.
- c. A student who is admitted to the co-op program gives permission to the University to provide a copy of the applicant's resume, university transcript and work term evaluations to potential employers.
- d. A student who has been accepted to BCOP may independently obtain a work term placement in consultation with the ASM-CE. Such employment positions must satisfy the criteria for work terms, be confirmed in writing by the employer and be approved by the ASM-CE before the first day of the work term according to the University Diary.

## 8. Registration and Evaluation of Performance

- a. In Work Terms I, II, and III, a student must register for Biology 199W, 299W, and 399W respectively.
- b. The Work Term evaluations shall consist of two components:
  - i. On-the-job Student Performance:

Job performance shall be assessed by Co-operative Education in consultation with the department using information gathered during the Work Term and input from the employer towards the end of the Work Term. Formal written documentation from the employer shall be sought. Evaluation of the job performance will result in one of the following classifications: OUTSTANDING, ABOVE EXPECTATIONS, SATISFACTORY, MARGINAL PASS, FAIL.
  - ii. Assignment(s):
    - A student is required to submit one or more assignment(s) to Co-operative Education as outlined in the course syllabus
    - Assignments(s) are evaluated by a faculty member and an ASM-CE.

Evaluation of the work term assignments will result in one of the following classifications: OUTSTANDING, ABOVE EXPECTATIONS, SATISFACTORY, MARGINAL PASS, FAIL.

The evaluation of the job performance and the assignment(s) are recorded separately on the transcript. Overall evaluation of the work term will result in one of the following final grades being awarded:

- Pass with Distinction: Indicates OUTSTANDING PERFORMANCE in both the assignment(s) and the job performance.
  - Pass: Indicates that PERFORMANCE MEETS EXPECTATIONS in both the assignment(s) and the job performance.
  - Fail: Indicates FAILING PERFORMANCE in the assignment(s) or the job performance, or both. To remain in BCOP, a student must obtain a final grade of Pass or higher.
- c. If a student fails to achieve the Work Term standards specified above, the student will be required to withdraw from BCOP. Such a student may reapply to the program, at which time the student will be required to repeat the Work Term with satisfactory performance.

- Only one Work Term may be repeated in the entire program.
- d. A student who withdraws from a Work Term without acceptable cause subsequent to a job placement will be required to withdraw permanently from BCOP.
  - e. A student who drops a Work Term without prior approval from both Co-operative Education and the Biology Co-op Liaison, or who fails to honour an agreement to work with an employer, or conducts him/herself in such a manner as to cause the discharge from the job, will be awarded an overall grade of FAIL for the Work Term in question and will be required to withdraw permanently from BCOP.
  - f. Permission to drop a Work Term does not constitute a waiver of degree requirements, and a student who has obtained such permission must complete an approved Work Term in lieu of the one dropped.

## **10.2.9 Honours in Biology (Co-operative)**

### **10.2.9.1 Admission Requirements**

See **Major in Biology (Co-operative)**.

### **10.2.9.2 Program of Study**

4. In addition to the requirements below, a student must fulfill all requirements for either an Honours in Biology, Honours in Biology (Cell and Molecular), Honours in Biology (Ecology and Conservation), or Honours in Biology (Marine) as described under each specific program.
5. To remain in BCOP Honours, a student must receive a passing grade in all required courses, and must maintain an average of at least 65% in all Biology courses and an overall average of at least 70% in all courses, including electives.
6. A student is required to complete three work terms, one of which will normally be either in the Fall or Winter semester.

## **11.2.1 Work Term Descriptions**

The following Work Terms are a requirement of the Biology (Co-operative) Program (BCOP) only.

**199W Work Term I** follows the successful completion of Semester 4. Students are expected to learn, develop and practice the high standards of behaviour and performance normally expected in the work environment. Students will observe, apply, analyse and/or evaluate concepts from Biology courses in the workplace and further their understanding of the principles of biology and how they are applied in a professional setting.

CH: 0

LC: 0

PR: Admission to the Biology Major and successful completion of semester 4

### **299W**

#### **Work Term II**

follows the successful completion of Semester 6. Students are expected to further develop and expand their knowledge and work-related skills and should be able to accept increased responsibility and challenge. In addition, students are expected to demonstrate an ability to deal with increasingly complex work-related concepts and problems. Students will continue to observe, apply, analyse and/or evaluate concepts from biology courses in the workplace and continue to further their understanding of the principles of biology and how they are applied in a professional setting. Students are required to complete one or more assignments, as outlined in the syllabus

CH: 0

LC: 0

PR: BIOL 199W

### **399W**

#### **Work Term III**

follows the successful completion of semester 7 or Work Term II. Students will have sufficient academic grounding and work experience to contribute in a positive manner to the problem-solving and management processes needed and practiced in the work environment. Students should become better acquainted with their discipline of study, should observe and appreciate the attitudes, responsibilities, and ethics normally expected of professionals and should exercise greater independence and responsibility in their assigned work functions.

CH: 0

LC: 0

PR: BIOL 299W

**Rationale**

This proposal is being put forward as the current calendar description for the Biology Cooperative program does not accurately current practices. The proposed calendar changes will enable students to fully understand what they will learn in the Cooperative Program and what their responsibilities are once accepted. The proposed changes also allow for more flexibility in the scheduling of work terms so as to not impede the ability of students to take Fall and Winter restricted core courses.

**Consultations Sought From**

- Arts
- Business Administration
- Co-operative Education
- Education
- Engineering
- Grenfell Campus
- Human Kinetics and Recreation
- Marine Institute
- Medicine
- Music
- Nursing
- Pharmacy
- Science
- Social Work

**Comments Received**

- Yes/No
- Yes/No
- Yes/No
- Yes/No
- Yes/No
- Yes/No
- Yes/No
- Yes/No
- Yes/No
- Yes/No
- Yes/No
- Yes/No
- Yes/No
- Yes/No

**Library Report Received**

Yes / No

**Signature: Dean, Associate Vice-President (Academic) or Vice-President**

Name \_\_\_\_\_

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**FOR OFFICE USE ONLY**

**APPROVAL GRANTED BY SENATE COMMITTEE ON UNDERGRADUATE STUDIES**

Chair: \_\_\_\_\_

Secretary: \_\_\_\_\_

Date: \_\_\_\_\_

# Proposal

## Calendar Change(s) to Existing Program(s)

### Executive Summary

The Department of Biology would like to remove CHEM 1010 Introductory Chemistry, CHEM 1011 Introductory Chemistry II, and CHEM 2440 Organic Chemistry for Biologists from our existing Majors and Honours programs. CHEM 1010/1011 will be replaced with CHEM 1050/1051 (or CHEM 1200 and 1001), and CHEM 2440 will be replaced by CHEM 2400 and 2401.

The addition of the more rigorous CHEM 1050/1051 (or CHEM 1200 and 1001) and CHEM 2400/2401 will provide students with a more complete foundation in basic and organic chemistry without disrupting the prescribed course schedule for each of our Majors and Honours programs.

### Resource Implications: Instructional Costs

No new resources are required.

### Consultations

The internal distribution list for Calendar changes.

### Library Holdings and/or Other Resources Required

No new library resources or costs are required or anticipated.

Signature of Unit Head (if appropriate): \_\_\_\_\_

Date: \_\_\_\_\_

Signature of Dean/Associate Vice-President (Academic)/Vice-President:

\_\_\_\_\_

Date: \_\_\_\_\_

**SUMMARY PAGE FOR SENATE****Approval Form****Major and Honours in Biology****Major, Honours, Major (Co-operative), Honours (Co-operative) in Biology (Cell & Molecular)****Major, Honours, Major (Co-operative), Honours (Co-operative) in Biology (Ecology & Conservation)****Honours and Honours (Co-operative) in Biology (Marine)****Calendar Change(s) - See attached****10.2.1 Entrance Requirements**

Entry to the Biology Majors Program is competitive and based on academic standing.

To be considered for admission to the program students must have completed Biology 1001/1002 with an average of at least 65%. In addition, applicants will normally have completed the following courses (or their equivalents) and must have a minimum overall average of 60% in these courses.

1. English 1090 or the former English 1080, 1110 or equivalent
2. Mathematics 1090 and Mathematics 1000 (or Mathematics 109A/B and Mathematics 1000, or Mathematics 1000 only)
3. Chemistry ~~4040/4044~~ 1050 and 1051 (or 1200 and 1001 or the former 1010 and 1011) or Physics 1020/1021 (or equivalent )
4. If Mathematics 1000 taken, any one other first year course.

Chemistry ~~4040/4044 (or 1050/and 1051)~~ (or 1200 and 1001) should be taken in the first year, as it is a prerequisite for other required courses in the programs, and delaying chemistry until second year may make it difficult to complete the program in the normal eight semesters.

**10.2.2 Minor in Biology**

A minor in Biology will consist of 24 credit hours in Biology courses: 1001 and 1002 (or equivalent) plus any 18 credit hours chosen from the list of Biology courses except Biology 2040, 2041, 2120, 3053, and 3820. The choice of courses must be made in consultation with the Head of Biology or delegate and it is recommended (but not required) that students take at least two Biology courses at the 3000 level or above.

**10.2.3 General Degrees**

Each Major is assigned a faculty advisor who should be consulted on academic problems, including course selection.

**10.2.3.1 Major in Biology**

All students majoring in Biology are required to complete a minimum of 45 credit hours in courses from the Department of Biology offering. Those 45 credit hours must include:

Biology 1001 and 1002 or their equivalents; the 15 credit hours in core courses listed below; and 24 credit hours in Biology electives at the 2000, 3000 or 4000 level except Biology 2040, 2041, 2120, 3053, and 3820.

Biology Core (15 credit hours): Biology 2060, 2250, 2600, 2900, plus one of Biology 3401, 3402, 4245 or 4404.

A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

All majors must also successfully complete the following courses or their equivalents:

1. English 1090 or the former English 1080 and 1110 (or equivalent)
2. Physics 1020 and 1021 (or equivalent)
3. Mathematics 1000
4. Chemistry ~~1010/1011~~ 1050 and 1051 (or 1200 and 1001 or the former 1010 and 1011),  
Chemistry ~~2440~~ 2400 and 2401 or the former 2440
5. Statistics 2550
6. Biochemistry 2101 and 3106
7. Extra Science courses as necessary to fulfil the requirement for 78 credit hours in Science as stipulated in Clause 3.a. of the [Regulations for the General Degree of Bachelor of Science](#).

It is recommended, but not required, that a Computer Science course be included and the Department of Biology strongly recommends Computer Science 1000 or 1600.

**Note:** *To minimize timetabling problems, students on the St. John's campus are advised to take Biology 2250 and 2600 in their third semester (Fall), and 2060 and 2900 in their fourth semester (Winter).*

### 10.2.3.2 Major in Biology (Cell and Molecular)

All students majoring in Biology (Cell and Molecular) are required to complete a minimum of 45 credit hours in courses from the Department of Biology offering. Those 45 credit hours must include:

Biology 1001 and 1002 or their equivalents; the 15 credit hours in core courses listed below; Biology 3530 and 4241; 6 credit hours from the recommended Biology courses for Biology (Cell and Molecular) listed below; and 12 credit hours from Biology electives at the 2000, 3000 or 4000 level except Biology 2040, 2041, 2120, 3053, and 3820.

Biology Core (15 credit hours): Biology 2060, 2250, 2600, 2900, plus one of Biology 3401, 3402, 4245 or 4404.

Recommended Biology courses for Biology (Cell and Molecular)) are 3050, 3052, 3401, 3402, 3500, 3620, 3950, 3951, 4010, 4040, 4050, 4200, 4245, 4250, 4251, 4255, 4404, 4550, 4605, and 4607.

A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

All majors must also successfully complete the following courses or their equivalents:

1. English 1090 or the former English 1080 and 1110 (or equivalent)
2. Physics 1020 and 1021 (or equivalent)
3. Mathematics 1000
4. Chemistry ~~1010 and 1011~~ 1050 and 1051 (or 1200 and 1001 or the former 1010 and 1011),  
Chemistry ~~2440~~ 2400 and 2401 or the former 2440
5. Statistics 2550
6. Biochemistry 2101 and 3106
7. Extra Science courses as necessary to fulfil the requirement for 78 credit hours in Science as stipulated in Clause 3.a. of the [Regulations for the General Degree of Bachelor of Science](#).

It is recommended, but not required, that a Computer Science course be included and the Department of Biology strongly recommends Computer Science 1000 or 1600.

**Note:** *To minimize timetabling problems, students on the St. John's campus are advised to take Biology 2250 and 2600 in their third semester (Fall), and 2060 and 2900 in their fourth semester (Winter).*

### 10.2.3.3 Major in Biology (Ecology and Conservation)

All students majoring in Biology (Ecology and Conservation) are required to complete a minimum of 45 credit hours in courses from the Department of Biology offering. Those 45 credit hours must include:

Biology 1001 and 1002 or their equivalents; the 15 credit hours in core courses listed below; Biology 4650 and 4651; 6 credit hours from the recommended Biology courses for Biology (Ecology and Conservation) listed below; and 12 credit hours from Biology electives at the 2000, 3000 or 4000 level except Biology 2040, 2041, 2120, 3053, and 3820.

Biology Core (15 credit hours): Biology 2060, 2250, 2600, 2900, plus one of Biology 3401, 3402, 4245 or 4404.

Recommended Biology courses for Biology (Ecology and Conservation) are 3041, 3050, 3295, 3300, 3610, 3620, 3640, 3709, 3710, 3711, 3714, 3715, 3750, 4040, 4141, 4180, 4182, 4250, 4306, 4307, 4360, 4405, 4505, 4605, 4607, 4620, 4630, 4701, 4710, 4750, and 4820.

A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

All majors must also successfully complete the following courses or their equivalents:

1. English 1090 or the former English 1080 and 1110 (or equivalent)
2. Physics 1020 and 1021 (or equivalent)
3. Mathematics 1000
4. ~~Chemistry 4040 and 4044~~ 1050 and 1051 (or 1200 and 1001 or the former 1010 and 1011), Chemistry 2440 2400 and 2401 or the former 2440
5. Statistics 2550
6. Biochemistry 2101 and 3106
7. Extra Science courses as necessary to fulfil the requirement for 78 credit hours in Science as stipulated in Clause 3.a. of the [Regulations for the General Degree of Bachelor of Science](#).

It is recommended, but not required, that a Computer Science course be included and the Department of Biology strongly recommends Computer Science 1000 or 1600.

**Note:** *To minimize timetabling problems, students on the St. John's campus are advised to take Biology 2250 and 2600 in their third semester (Fall), and 2060 and 2900 in their fourth semester (Winter).*

#### 10.2.4 Honours Degrees

The attention of students wishing to take Honours is called to those sections of the Calendar dealing with Regulations for the Degree of Bachelor of Science (Honours).

Sixty-nine credit hours in courses, including the 6 first year credit hours and the 15 required core credit hours outlined in the regulations for the General Degree, and the Honours Dissertation (Biology 499A/499B), shall be taken from the Department of Biology offering. Students may elect to complete an Honours Program in Biology or in one of the joint Honours Programs listed under the heading "Programs in Biology". Programs of students taking Honours shall be drawn up in consultation with the student's supervisor, and must be approved by the Head of the Department (or his/her delegate) in accordance with [Admission and Registration](#), clause 2. of the [Regulations for the Honours Degree of Bachelor of Science](#).

**Note:** *Some Graduate Courses may be taken in the final year of the Honours Program with the permission of the Head of the Department and the course instructor.*

A dissertation (6 credit hours) is to be presented on some original piece of work undertaken by the candidate, under the guidance of a faculty member of the department, as appointed by the Head of Department. For students electing to take one of the Joint Honours Programs, the dissertation shall be on a topic representative of the selected program. The Department of Biology considers the dissertation to be an important part of the Honours Program.

The dissertation will be based on a 6 credit hours course (Biology 499A/499B). It will involve directed reading relevant to the dissertation topic, preparation of a dissertation outline, supervised research, data synthesis and interpretation, and preparation and defence of the dissertation.



Two typed copies of the dissertation, complete with figures and tables, are to be submitted not less than two weeks before the end of lectures in the semester in which the candidate is registered for Biology 499B. These copies must be submitted to the Head of Department, and must have met the prior approval of the candidate's Honours supervisor.

Before the last day for examinations in the semester, the candidate will be examined orally on the contents of the dissertation. The examining committee shall consist of the Head of the Department, or delegate, the candidate's supervisor, and an examiner appointed by the Head of the Department in consultation with the candidate's supervisor.

### **10.2.5 Honours in Biology**

An Honours degree in Biology may comprise a broadly based selection of courses according to the student's interests, or it may be more narrowly focussed. An Honours student may focus on any area of Biology where an appropriate supervisor can be found. All Honours students should choose courses in consultation with their supervisors, but it is particularly important that students wishing to focus within the Honours degree should discuss course selection with an Honours supervisor within their area of interest.

#### **10.2.5.1 Biology Course Requirements**

Students seeking an honours degree in Biology are required to successfully complete a minimum of 69 credit hours in courses from the Department of Biology offering. Those 69 credit hours must include:

1. Biology 1001 and 1002 or their equivalents;
2. 15 credit hours in the following core courses: Biology 2060, 2250, 2600, 2900, plus one of Biology 3401, 3402, 4245 or 4404; and
3. 42 credit hours from Biology electives at the 2000, 3000 or 4000 level (except Biology 2040, 2041, 2120, 3053, and 3820) and Biology 499A and 499B.
4. A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

#### **10.2.5.2 Core Course Requirements**

All honours students must also successfully complete the following courses or their equivalents:

1. English 1090 or the former English 1080 and 1110 (or equivalent)
2. Physics 1020 and 1021 (or equivalent)
3. Mathematics 1000
4. Chemistry ~~4040 and 4044~~ 1050 and 1051 (or 1200 and 1001 or the former 1010 and 1011),  
Chemistry ~~2440~~ 2400 and 2401 or the former 2440
5. Statistics 2550
6. Biochemistry 2101 and 3106
7. Electives to make up 120 credit hours

To minimize timetabling problems, students on the St. John's Campus are advised to take Biology 2250 and 2600 in their third semester (Fall), and Biology 2060 and 2900 in their fourth semester (Winter).

### **10.2.6 Honours in Cell and Molecular Biology**

#### **10.2.6.1 Cell and Molecular Biology Course Requirements**

Students seeking an honours degree in Cell and Molecular Biology are required to complete a minimum of 69 credit hours in courses from the Department of Biology offering. Those 69 credit hours must include:

1. Biology 1001 and 1002 or their equivalents;
2. 15 credit hours in the following core courses: Biology 2060, 2250, 2600, 2900, plus one of Biology 3401, 3402, 4245 or 4404;

3. Biology 3530 and Biology 4241;
4. 12 credit hours from the following recommended Biology courses for Cell and Molecular Biology:  
Biology 3050, 3052, 3401, 3402, 3500, 3620, 3950, 3951, 4010, 4040, 4050, 4200, 4245, 4250, 4251, 4255, 4404, 4550, 4605, 4607; and
5. 24 credit hours in Biology electives at the 2000, 3000 or 4000 level (except Biology 2040, 2041, 2120, 3053, and 3820) and Biology 499A and 499B.
6. A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

### 10.2.6.2 Core Course Requirements

All honours students must also successfully complete the following courses or their equivalents:

1. English 1090 or the former English 1080 and 1110 (or equivalent)
2. Physics 1020 and 1021 (or equivalent)
3. Mathematics 1000
4. Chemistry ~~1010 and 1014~~ 1050 and 1051 (or 1200 and 1001 or the former 1010 and 1011),  
Chemistry ~~2440~~ 2400 and 2401 or the former 2440
5. Statistics 2550
6. Biochemistry 2101 and 3106
7. Electives to make up 120 credit hours

To minimize timetabling problems, students on the St. John's Campus are advised to take Biology 2250 and 2600 in their third semester (Fall), and Biology 2060 and 2900 in their fourth semester (Winter).

### 10.2.7 Honours in Ecology and Conservation Biology

#### 10.2.7.1 Ecology and Conservation Biology Course Requirements

Students seeking an honours degree in Ecology and Conservation Biology are required to complete a minimum of 69 credit hours in courses from the Department of Biology offering. Those 69 credit hours must include:

1. Biology 1001 and 1002 or their equivalents;
2. 15 credit hours in the following core courses: Biology 2060, 2250, 2600, 2900, plus one of Biology 3401, 3402, 4245 or 4404;
3. Biology 4650 and 4651;
4. 12 credit hours from the following recommended biology courses for Ecology and Conservation Biology:  
Biology 3041, 3050, 3295, 3300, 3610, 3620, 3640, 3709, 3710, 3711, 3714, 3715, 3750, 4040, 4141, 4180, 4182, 4250, 4306, 4307, 4360, 4405, 4505, 4605, 4607, 4620, 4630, 4701, 4710, 4750, 4820; and
5. 24 credit hours in Biology electives at the 2000, 3000 or 4000 level (except Biology 2040, 2041, 2120, 3053, and 3820) and Biology 499A and 499B.
6. A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

#### 10.2.7.2 Core Course Requirements

All honours students must also successfully complete the following courses or their equivalents:

1. English 1090 or the former English 1080 and 1110 (or equivalent)
2. Physics 1020 and 1021 (or equivalent)
3. Mathematics 1000
4. Chemistry ~~1010 and 1014~~ 1050 and 1051 (or 1200 and 1001 or the former 1010 and 1011),  
Chemistry ~~2440~~ 2400 and 2401 or the former 2440
5. Statistics 2550
6. Biochemistry 2101 and 3106
7. Electives to make up 120 credit hours

To minimize timetabling problems, students on the St. John's Campus are advised to take Biology 2250 and 2600 in their third semester (Fall), and Biology 2060 and 2900 in their fourth semester (Winter).

## 10.2.8 Honours in Marine Biology

### 10.2.8.1 Marine Biology Course Requirements

Students seeking an honours degree in Marine Biology are required to complete a minimum of 69 credit hours in courses from the Department of Biology offering. Those 69 credit hours must include:

1. Biology 1001 and 1002 or their equivalents;
2. 15 credit hours in the following core courses: Biology 2060, 2250, 2600, 2900, plus one of Biology 3401, 3402, 4245 or 4404;
3. Biology 3710 and 3711;
4. 12 credit hours from the following recommended biology courses for Marine Biology: Biology 3014, 3050, 3295, 3620, 3640, 3709, 3712, 3714, 3715, 3951, 4122, 4141, 4182, 4360, 4601, 4605, 4607, 4620, 4630, 4710, 4750, 4810, 4912; and
5. 24 credit hours in Biology electives at the 2000, 3000 or 4000 level (except Biology 2040, 2041, 2120, 3053, and 3820) and Biology 499A and 499B.
6. A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

### 10.2.8.2 Core Course Requirements

All honours students must also successfully complete the following courses or their equivalents:

1. English 1090 or the former English 1080 and 1110 (or equivalent)
2. Physics 1020 and 1021 (or equivalent)
3. Mathematics 1000
4. Chemistry ~~1010 and 1011~~ 1050 and 1051 (or 1200 and 1001 or the former 1010 and 1011),  
Chemistry ~~2440-2400 and 2401~~ or the former 2440
5. Statistics 2550
6. Biochemistry 2101 and 3106
7. Electives to make up 120 credit hours

To minimize timetabling problems, students on the St. John's Campus are advised to take Biology 2250 and 2600 in their third semester (Fall), and Biology 2060 and 2900 in their fourth semester (Winter).

## 11.2 Biology

According to the nature of particular courses, the specified number of laboratory hours may consist of some combination of laboratory work, seminars or directed independent study relevant to the practical aspects of the subject matter. Biology courses are designated by BIOL.

### 2010 Biology of Plants

is a study of the structure, function and reproductive biology of plants, with emphasis on the vascular plants, and on their relationship to environment and human activities.

LH: 3

PR: Science 1807; BIOL 1001 and 1002; Chemistry ~~1010 or 1050~~ (or 1200 (or the former Chemistry 1000 or 1010))

### 2060 Principles of Cell Biology

is a modern view of the biology of eukaryotic cells, organelles and molecules and their interactions in the functioning of living organisms.

CO: Physics 1021 or 1051; Biochemistry 2101

CR: the former BIOL 3060

LH: 3

PR: Physics 1021 or 1051; Biochemistry 2101

PR: Science 1807; BIOL 1001, 1002 and 2250; Chemistry ~~2440~~ or 2400 or the former 2440

### **2250 Principles of Genetics**

is an introduction to Mendelian and molecular genetics. Phenotype and genotype, behaviour of alleles in genetic crosses, chromosome theory of inheritance, genetic linkage, molecular biology of DNA, RNA and protein, molecular basis of mutation, recombinant DNA, applications of genetic biotechnology.

CO: Chemistry ~~2440~~ or 2400 or the former 2440

CR: Biochemistry 2100 the former BIOL 3250

LH: 3

PR: Science 1807; BIOL 1001 and 1002; Chemistry ~~1010 and 1011 (or 1050/1051)~~ (or 1200 and 1001 or the former 1010 and 1011)

PR: Chemistry ~~2440~~ or 2400 or the former 2440

### **Secondary Calendar Changes**

None.

### **Calendar Entry After Changes**

#### **10.2.1 Entrance Requirements**

Entry to the Biology Majors Program is competitive and based on academic standing.

To be considered for admission to the program students must have completed Biology 1001/1002 with an average of at least 65%. In addition, applicants will normally have completed the following courses (or their equivalents) and must have a minimum overall average of 60% in these courses.

1. English 1090 or the former English 1080, 1110 or equivalent
2. Mathematics 1090 and Mathematics 1000 (or Mathematics 109A/B and Mathematics 1000, or Mathematics 1000 only)
3. Chemistry 1050 and 1051 (or 1200 and 1001 or the former 1010 and 1011) or Physics 1020/1021 (or equivalent )
4. If Mathematics 1000 taken, any one other first year course.

Chemistry 1050 and 1051(or 1200 and 1001) should be taken in the first year, as it is a prerequisite for other required courses in the programs, and delaying chemistry until second year may make it difficult to complete the program in the normal eight semesters.

#### **10.2.2 Minor in Biology**

A minor in Biology will consist of 24 credit hours in Biology courses: 1001 and 1002 (or equivalent) plus any 18 credit hours chosen from the list of Biology courses except Biology 2040, 2041, 2120, 3053, and 3820. The choice of courses must be made in consultation with the Head of Biology or delegate and it is recommended (but not required) that students take at least two Biology courses at the 3000 level or above.

#### **10.2.3 General Degrees**

Each Major is assigned a faculty advisor who should be consulted on academic problems, including course selection.

##### **10.2.3.1 Major in Biology**

All students majoring in Biology are required to complete a minimum of 45 credit hours in courses from the Department of Biology offering. Those 45 credit hours must include:

Biology 1001 and 1002 or their equivalents; the 15 credit hours in core courses listed below; and 24 credit hours in Biology electives at the 2000, 3000 or 4000 level except Biology 2040, 2041, 2120, 3053, and 3820.

Biology Core (15 credit hours): Biology 2060, 2250, 2600, 2900, plus one of Biology 3401, 3402, 4245 or 4404.

A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

All majors must also successfully complete the following courses or their equivalents:

1. English 1090 or the former English 1080 and 1110 (or equivalent)
2. Physics 1020 and 1021 (or equivalent)
3. Mathematics 1000
4. Chemistry 1050 and 1051 (or 1200 and 1001 or the former 1010 and 1011), Chemistry 2400 and 2401 or the former 2440
5. Statistics 2550
6. Biochemistry 2101 and 3106
7. Extra Science courses as necessary to fulfil the requirement for 78 credit hours in Science as stipulated in Clause 3.a. of the [Regulations for the General Degree of Bachelor of Science](#).

It is recommended, but not required, that a Computer Science course be included and the Department of Biology strongly recommends Computer Science 1000 or 1600.

**Note:** *To minimize timetabling problems, students on the St. John's campus are advised to take Biology 2250 and 2600 in their third semester (Fall), and 2060 and 2900 in their fourth semester (Winter).*

### 10.2.3.2 Major in Biology (Cell and Molecular)

All students majoring in Biology (Cell and Molecular) are required to complete a minimum of 45 credit hours in courses from the Department of Biology offering. Those 45 credit hours must include:

Biology 1001 and 1002 or their equivalents; the 15 credit hours in core courses listed below; Biology 3530 and 4241; 6 credit hours from the recommended Biology courses for Biology (Cell and Molecular) listed below; and 12 credit hours from Biology electives at the 2000, 3000 or 4000 level except Biology 2040, 2041, 2120, 3053, and 3820.

Biology Core (15 credit hours): Biology 2060, 2250, 2600, 2900, plus one of Biology 3401, 3402, 4245 or 4404.

Recommended Biology courses for Biology (Cell and Molecular))

are 3050, 3052, 3401, 3402, 3500, 3620, 3950, 3951, 4010, 4040, 4050, 4200, 4245, 4250, 4251, 4255, 4404, 4550, 4605, and 4607.

A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

All majors must also successfully complete the following courses or their equivalents:

1. English 1090 or the former English 1080 and 1110 (or equivalent)
2. Physics 1020 and 1021 (or equivalent)
3. Mathematics 1000
4. Chemistry 1050 and 1051 (or 1200 and 1001 or the former 1010 and 1011), Chemistry 2400 and 2401 or the former 2440
5. Statistics 2550
6. Biochemistry 2101 and 3106
7. Extra Science courses as necessary to fulfil the requirement for 78 credit hours in Science as stipulated in Clause 3.a. of the [Regulations for the General Degree of Bachelor of Science](#).

It is recommended, but not required, that a Computer Science course be included and the Department of Biology strongly recommends Computer Science 1000 or 1600.

**Note:** *To minimize timetabling problems, students on the St. John's campus are advised to take*

*Biology 2250 and 2600 in their third semester (Fall), and 2060 and 2900 in their fourth semester (Winter).*

### **10.2.3.3 Major in Biology (Ecology and Conservation)**

All students majoring in Biology (Ecology and Conservation) are required to complete a minimum of 45 credit hours in courses from the Department of Biology offering. Those 45 credit hours must include:

Biology 1001 and 1002 or their equivalents; the 15 credit hours in core courses listed below; Biology 4650 and 4651; 6 credit hours from the recommended Biology courses for Biology (Ecology and Conservation) listed below; and 12 credit hours from Biology electives at the 2000, 3000 or 4000 level except Biology 2040, 2041, 2120, 3053, and 3820.

Biology Core (15 credit hours): Biology 2060, 2250, 2600, 2900, plus one of Biology 3401, 3402, 4245 or 4404.

Recommended Biology courses for Biology (Ecology and Conservation)

are 3041, 3050, 3295, 3300, 3610, 3620, 3640, 3709, 3710, 3711, 3714, 3715, 3750, 4040, 4141, 4180, 4182, 4250, 4306, 4307, 4360, 4405, 4505, 4605, 4607, 4620, 4630, 4701, 4710, 4750, and 4820.

A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

All majors must also successfully complete the following courses or their equivalents:

1. English 1090 or the former English 1080 and 1110 (or equivalent)
2. Physics 1020 and 1021 (or equivalent)
3. Mathematics 1000
4. Chemistry 1050 and 1051 (or 1200 and 1001 or the former 1010 and 1011), Chemistry 2400 and 2401 or the former 2440
5. Statistics 2550
6. Biochemistry 2101 and 3106
7. Extra Science courses as necessary to fulfil the requirement for 78 credit hours in Science as stipulated in Clause 3.a. of the [Regulations for the General Degree of Bachelor of Science](#).

It is recommended, but not required, that a Computer Science course be included and the Department of Biology strongly recommends Computer Science 1000 or 1600.

**Note:** *To minimize timetabling problems, students on the St. John's campus are advised to take Biology 2250 and 2600 in their third semester (Fall), and 2060 and 2900 in their fourth semester (Winter).*

### **10.2.4 Honours Degrees**

The attention of students wishing to take Honours is called to those sections of the Calendar dealing with Regulations for the Degree of Bachelor of Science (Honours).

Sixty-nine credit hours in courses, including the 6 first year credit hours and the 15 required core credit hours outlined in the regulations for the General Degree, and the Honours Dissertation (Biology 499A/499B), shall be taken from the Department of Biology offering. Students may elect to complete an Honours Program in Biology or in one of the joint Honours Programs listed under the heading "Programs in Biology". Programs of students taking Honours shall be drawn up in consultation with the student's supervisor, and must be approved by the Head of the Department (or his/her delegate) in accordance with [Admission and Registration](#), clause 2. of the [Regulations for the Honours Degree of Bachelor of Science](#).

**Note:** *Some Graduate Courses may be taken in the final year of the Honours Program with the permission of the Head of the Department and the course instructor.*

A dissertation (6 credit hours) is to be presented on some original piece of work undertaken by the

candidate, under the guidance of a faculty member of the department, as appointed by the Head of Department. For students electing to take one of the Joint Honours Programs, the dissertation shall be on a topic representative of the selected program. The Department of Biology considers the dissertation to be an important part of the Honours Program.

The dissertation will be based on a 6 credit hours course (Biology 499A/499B). It will involve directed reading relevant to the dissertation topic, preparation of a dissertation outline, supervised research, data synthesis and interpretation, and preparation and defence of the dissertation.

Two typed copies of the dissertation, complete with figures and tables, are to be submitted not less than two weeks before the end of lectures in the semester in which the candidate is registered for Biology 499B. These copies must be submitted to the Head of Department, and must have met the prior approval of the candidate's Honours supervisor.

Before the last day for examinations in the semester, the candidate will be examined orally on the contents of the dissertation. The examining committee shall consist of the Head of the Department, or delegate, the candidate's supervisor, and an examiner appointed by the Head of the Department in consultation with the candidate's supervisor.

### **10.2.5 Honours in Biology**

An Honours degree in Biology may comprise a broadly based selection of courses according to the student's interests, or it may be more narrowly focussed. An Honours student may focus on any area of Biology where an appropriate supervisor can be found. All Honours students should choose courses in consultation with their supervisors, but it is particularly important that students wishing to focus within the Honours degree should discuss course selection with an Honours supervisor within their area of interest.

#### **10.2.5.1 Biology Course Requirements**

Students seeking an honours degree in Biology are required to successfully complete a minimum of 69 credit hours in courses from the Department of Biology offering. Those 69 credit hours must include:

1. Biology 1001 and 1002 or their equivalents;
2. 15 credit hours in the following core courses: Biology 2060, 2250, 2600, 2900, plus one of Biology 3401, 3402, 4245 or 4404; and
3. 42 credit hours from Biology electives at the 2000, 3000 or 4000 level (except Biology 2040, 2041, 2120, 3053, and 3820) and Biology 499A and 499B.
4. A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

#### **10.2.5.2 Core Course Requirements**

All honours students must also successfully complete the following courses or their equivalents:

1. English 1090 or the former English 1080 and 1110 (or equivalent)
2. Physics 1020 and 1021 (or equivalent)
3. Mathematics 1000
4. Chemistry 1050 and 1051 (or 1200 and 1001 or the former 1010 and 1011), Chemistry 2400 and 2401 or the former 2440
5. Statistics 2550
6. Biochemistry 2101 and 3106
7. Electives to make up 120 credit hours

To minimize timetabling problems, students on the St. John's Campus are advised to take Biology 2250 and 2600 in their third semester (Fall), and Biology 2060 and 2900 in their fourth semester (Winter).

## 10.2.6 Honours in Cell and Molecular Biology

### 10.2.6.1 Cell and Molecular Biology Course Requirements

Students seeking an honours degree in Cell and Molecular Biology are required to complete a minimum of 69 credit hours in courses from the Department of Biology offering. Those 69 credit hours must include:

1. Biology 1001 and 1002 or their equivalents;
2. 15 credit hours in the following core courses: Biology 2060, 2250, 2600, 2900, plus one of Biology 3401, 3402, 4245 or 4404;
3. Biology 3530 and Biology 4241;
4. 12 credit hours from the following recommended Biology courses for Cell and Molecular Biology:  
Biology 3050, 3052, 3401, 3402, 3500, 3620, 3950, 3951, 4010, 4040, 4050, 4200, 4245, 4250, 4251, 4255, 4404, 4550, 4605, 4607; and
5. 24 credit hours in Biology electives at the 2000, 3000 or 4000 level (except Biology 2040, 2041, 2120, 3053, and 3820) and Biology 499A and 499B.
6. A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

### 10.2.6.2 Core Course Requirements

All honours students must also successfully complete the following courses or their equivalents:

1. English 1090 or the former English 1080 and 1110 (or equivalent)
2. Physics 1020 and 1021 (or equivalent)
3. Mathematics 1000
4. Chemistry 1050 and 1051 (or 1200 and 1001 or the former 1010 and 1011), Chemistry 2400 and 2401 or the former 2440
5. Statistics 2550
6. Biochemistry 2101 and 3106
7. Electives to make up 120 credit hours

To minimize timetabling problems, students on the St. John's Campus are advised to take Biology 2250 and 2600 in their third semester (Fall), and Biology 2060 and 2900 in their fourth semester (Winter).

## 10.2.7 Honours in Ecology and Conservation Biology

### 10.2.7.1 Ecology and Conservation Biology Course Requirements

Students seeking an honours degree in Ecology and Conservation Biology are required to complete a minimum of 69 credit hours in courses from the Department of Biology offering. Those 69 credit hours must include:

1. Biology 1001 and 1002 or their equivalents;
2. 15 credit hours in the following core courses: Biology 2060, 2250, 2600, 2900, plus one of Biology 3401, 3402, 4245 or 4404;
3. Biology 4650 and 4651;
4. 12 credit hours from the following recommended biology courses for Ecology and Conservation Biology:  
Biology 3041, 3050, 3295, 3300, 3610, 3620, 3640, 3709, 3710, 3711, 3714, 3715, 3750, 4040, 4141, 4180, 4182, 4250, 4306, 4307, 4360, 4405, 4505, 4605, 4607, 4620, 4630, 4701, 4710, 4750, 4820; and
5. 24 credit hours in Biology electives at the 2000, 3000 or 4000 level (except Biology 2040, 2041, 2120, 3053, and 3820) and Biology 499A and 499B.
6. A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

### 10.2.7.2 Core Course Requirements

All honours students must also successfully complete the following courses or their equivalents:



1. English 1090 or the former English 1080 and 1110 (or equivalent)
2. Physics 1020 and 1021 (or equivalent)
3. Mathematics 1000
4. Chemistry 1050 and 1051 (or 1200 and 1001 or the former 1010 and 1011), Chemistry 2400 and 2401 or the former 2440
5. Statistics 2550
6. Biochemistry 2101 and 3106
7. Electives to make up 120 credit hours

To minimize timetabling problems, students on the St. John's Campus are advised to take Biology 2250 and 2600 in their third semester (Fall), and Biology 2060 and 2900 in their fourth semester (Winter).

### **10.2.8 Honours in Marine Biology**

#### **10.2.8.1 Marine Biology Course Requirements**

Students seeking an honours degree in Marine Biology are required to complete a minimum of 69 credit hours in courses from the Department of Biology offering. Those 69 credit hours must include:

1. Biology 1001 and 1002 or their equivalents;
2. 15 credit hours in the following core courses: Biology 2060, 2250, 2600, 2900, plus one of Biology 3401, 3402, 4245 or 4404;
3. Biology 3710 and 3711;
4. 12 credit hours from the following recommended biology courses for Marine Biology: Biology 3014, 3050, 3295, 3620, 3640, 3709, 3712, 3714, 3715, 3951, 4122, 4141, 4182, 4360, 4601, 4605, 4607, 4620, 4630, 4710, 4750, 4810, 4912; and
5. 24 credit hours in Biology electives at the 2000, 3000 or 4000 level (except Biology 2040, 2041, 2120, 3053, and 3820) and Biology 499A and 499B.
6. A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

#### **10.2.8.2 Core Course Requirements**

All honours students must also successfully complete the following courses or their equivalents:

1. English 1090 or the former English 1080 and 1110 (or equivalent)
2. Physics 1020 and 1021 (or equivalent)
3. Mathematics 1000
4. Chemistry 1050 and 1051 (or 1200 and 1001 or the former 1010 and 1011), Chemistry 2400 and 2401 or the former 2440
5. Statistics 2550
6. Biochemistry 2101 and 3106
7. Electives to make up 120 credit hours

To minimize timetabling problems, students on the St. John's Campus are advised to take Biology 2250 and 2600 in their third semester (Fall), and Biology 2060 and 2900 in their fourth semester (Winter).

### **11.2 Biology**

According to the nature of particular courses, the specified number of laboratory hours may consist of some combination of laboratory work, seminars or directed independent study relevant to the practical aspects of the subject matter. Biology courses are designated by BIOL.

#### **2010 Biology of Plants**

is a study of the structure, function and reproductive biology of plants, with emphasis on the vascular plants, and on their relationship to environment and human activities.

LH: 3

PR: Science 1807; BIOL 1001 and 1002; Chemistry 1050 (or 1200 or the former Chemistry 1000 or 1010)

### **2060 Principles of Cell Biology**

is a modern view of the biology of eukaryotic cells, organelles and molecules and their interactions in the functioning of living organisms.

CO: Physics 1021 or 1051; Biochemistry 2101

CR: the former BIOL 3060

LH: 3

PR: Physics 1021 or 1051; Biochemistry 2101

PR: Science 1807; BIOL 1001, 1002 and 2250; Chemistry 2400 or the former 2440

### **2250 Principles of Genetics**

is an introduction to Mendelian and molecular genetics. Phenotype and genotype, behaviour of alleles in genetic crosses, chromosome theory of inheritance, genetic linkage, molecular biology of DNA, RNA and protein, molecular basis of mutation, recombinant DNA, applications of genetic biotechnology.

CO: Chemistry 2400 or the former 2440

CR: Biochemistry 2100 the former BIOL 3250

LH: 3

PR: Science 1807; BIOL 1001 and 1002; Chemistry 1050/1051 (or 1200 and 1001 or the former 1010 and 1011)

PR: Chemistry 2400 or the former 2440

### **Rationale**

The addition of the more rigorous CHEM 1050/1051 (or CHEM 1200 and 1001) and CHEM 2400/2401 will provide students with a more complete foundation in basic and organic chemistry without disrupting the prescribed course schedule for each of our Majors and Honours programs.

### **Consultations Sought From**

Arts  
 Business Administration  
 Co-operative Education  
 Education  
 Engineering  
 Grenfell Campus (School of Science and the Environment)  
 Grenfell Campus (School of Fine Arts)  
 Human Kinetics and Recreation  
 Marine Institute  
 Medicine  
 Music  
 Nursing  
 Pharmacy  
 Chemistry  
 Biochemistry  
 Physics and Physical Oceanography  
 Social Work

### **Comments Received**

Yes/No  
 Yes/No  
 Yes/No  
 Yes  
 Yes  
 Yes  
 Yes  
 Yes  
 Yes/No  
 Yes  
 Yes/No  
 Yes/No  
 Yes/No  
 Yes  
 Yes  
 Yes  
 Yes

**Library Report Received**

Yes / No

**Signature: Dean, Associate Vice-President (Academic) or Vice-President**

Name \_\_\_\_\_

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**FOR OFFICE USE ONLY**

**APPROVAL GRANTED BY SENATE COMMITTEE ON UNDERGRADUATE STUDIES**

Chair: \_\_\_\_\_

Secretary: \_\_\_\_\_

Date: \_\_\_\_\_

## Proposal Deletion of CHEM 1011

### Executive Summary

Chemistry 1011 is to be deleted from the calendar.

### Resource Implications: Instructional Costs

There are no resource implications, negative or positive. Students will still need to take chemistry, but instead of CHEM 1011, they will require 1051.

### Library Holdings and/or Other Resources Required

There are no added library costs associated with the new course.

Signature of Unit Head (if appropriate): \_\_\_\_\_

Date: \_\_\_\_\_

Signature of Dean/Associate Vice-President (Academic)/Vice-President: \_\_\_\_\_

Date: \_\_\_\_\_

## SUMMARY PAGE FOR SENATE

### Approval Form

Edits:

#### Calendar Entries

Under 11.3 Chemistry

~~**1011 Introductory Chemistry II** examines atomic structure; periodic properties; chemical bonding including VSEPR shapes and polarity; introduction to valence bond theory and hybridization; liquids, solids and intermolecular forces; solubility equilibrium; electrochemistry.~~

~~AR: attendance is required in the laboratory component of this course. Failure to attend may result in a failing grade or deregistration from the course.~~

~~CR: CHEM 1001 and CHEM 1051~~

~~LH: 3 hours biweekly alternating with tutorials~~

~~OR: 1.5 hour tutorial alternating with labs~~

~~PR: Science 1807; CHEM 1010~~

~~UL: only 6 science credit hours will be awarded for a major or honours in Chemistry from the following course groups: CHEM 1010/1011/the former 1031, or CHEM 1010/1050/1051, or CHEM 1810/1200/1001 (Grenfell Campus)~~

Clean Version

## Secondary Calendar Changes

### Under 11.3 Chemistry

**1010 Introductory Chemistry I** examines descriptive chemistry; measurements; atoms; molecules; the mole; mole calculations and reaction stoichiometry; the balancing of redox reactions; gases; thermochemistry; introduction to chemical kinetics and equilibrium; acids and bases.

AR: attendance is required in the laboratory component of this course. Failure to attend may result in a failing grade or deregistration from the course.

CR: CHEM ~~1200~~1810

LC: 4

LH: 3 hours biweekly alternating with tutorials

OR: 1.5 hour tutorial alternating with labs

PR: Science 1807. It is recommended that students have successfully completed high school Academic Mathematics 3201, or a pass in any university level mathematics course

UL: only 6 science credit hours will be awarded for a major or honours in Chemistry from the following course groups: ~~CHEM 1010/1011/the former 1031~~, or CHEM 1010/1050/1051, or CHEM 1810/1200/1001 (Grenfell Campus), or CHEM 1010/the former 1011/the former 1031

**1050 General Chemistry I** builds on basic chemistry concepts from high school. Topics include gases; thermochemistry; atomic structure; periodic properties; chemical bonding including valence bond theory; hybridization and introduction to molecular orbital theory; properties of liquids and solids.

AR: attendance is required in the laboratory component of this course. Failure to attend may result in a failing grade or deregistration from the course.

CR: CHEM 1200

LC: 4

LH: 3

PR: Science 1807; CHEM 1010 with a grade of at least 60% or high school CHEM 3202 with a grade of at least 65%. It is also recommended that students have successfully completed high school Mathematics 3200 or 3201.

UL: only 6 science credit hours will be awarded for a major or honours in Chemistry from the following course groups: ~~CHEM 1010/1011/the former 1031~~, or CHEM 1010/1050/1051, or CHEM 1810/1200/1001 (Grenfell Campus), or CHEM 1010/the former 1011/the former 1031

**1051 General Chemistry II** builds on CHEM 1050 topics and on basic chemistry concepts from high school. Topics include solutions, kinetics, chemical equilibrium, equilibria involving acids and bases including polyprotic acids, buffers, acid-base indicators, titration curves, solubility and complex ion equilibrium, thermodynamics, and electrochemistry.

AR: attendance is required in the laboratory component of this course. Failure to attend may result in a failing grade or deregistration from the course.

CR: CHEM 1001 and the former CHEM 1011

LC: 4

LH: 3

PR: Science 1807; CHEM 1050 (or CHEM ~~Chemistry~~ 1200 with a minimum grade of 65%)

UL: only 6 science credit hours will be awarded for a major or honours in Chemistry from the following course groups: ~~CHEM 1010/1011/the former 1031~~, or CHEM 1010/1050/1051, or CHEM 1810/1200/1001 (Grenfell Campus), or CHEM 1010/the former 1011/the former 1031

**2400 Introductory Organic Chemistry I** is a course on bonding involving carbon; conformations and ~~stereochemistry~~ stereochemistry; introduction to functional groups and nomenclature; properties, syntheses and reactions of hydrocarbons, alkyl halides, alcohols and ethers.

AR: attendance is required in the laboratory component of this course. Failure to attend may result in a failing grade or deregistration from the course.

CR: the former CHEM 2440

LH: 3

PR: Science 1807; a minimum 60% in CHEM 1051, or CHEM 1010 and the former CHEM 1011 with a grade of at least 80% in each; or the former CHEM 1011 with a grade of at least 85%;-or CHEM 1001 (or the former CHEM 1031) with a grade of at least 65%

**2610 Introductory Chemical Oceanography** (same as Ocean Sciences 2100) provides an introduction to the fundamental chemical properties of seawater and the processes governing the concentrations of elements and compounds in the oceans. It is an introduction to the sources, distribution, and transformations of chemical constituents of the ocean, and their relation to biological, chemical, geological, and physical processes. Topics include: controls on average concentration of chemicals in the ocean; vertical and horizontal distributions of ocean constituents; air-sea interactions; production, export, and remineralization of organic matter; the ocean carbon cycle; human-induced changes; stable isotopes; and trace elements.

CR: Ocean Sciences 2100

PR: The former CHEM 1011 or 1051 or 1001 which may be taken concurrently ~~or CHEM 1001~~

Under 11.9 Ocean Sciences

## 2100

### Introductory Chemical Oceanography

(same as Chemistry 2610) provides an introduction to the fundamental chemical properties of seawater and the processes governing the concentrations of elements and compounds in the oceans. It is an introduction to the sources, distribution, and transformations of chemical constituents of the ocean, and their relation to biological, chemical, geological, and physical processes. Topics include: controls on average concentration of chemicals in the ocean; vertical and horizontal distributions of ocean constituents; air-sea interactions; production, export, and remineralization of organic matter; the ocean carbon cycle; human-induced changes; stable isotopes; and trace elements.

CR: Chemistry 2610

PR: The former CHEM ~~Chemistry~~ 1011 or 1051 or 1001 which may be taken concurrently

Under 10.3 Chemistry

### 10.3.3 Minor in Chemistry

Students who take a minor in Chemistry will complete CHEM Chemistry 1050 and 1051 (or 1010, the former 1011 and the former 1031) (or 1200 and 1001), CHEM Chemistry 2100, 2210, 2301 or 2302, and 2400, and 6 credit hours in other chemistry courses at the 2000 level or above.

#### **10.3.5.1 Required Courses**

1. CHEM Chemistry 1050 and 1051 (or 1010, the former 1011 and the former 1031) or 1200 and 1001), 2100, 2210, 2301, 2302, 2400, 2401, 3110, 3210, 3211, 3303, 3411, and 490A/B.

#### **10.3.9.2 Other Information**

5. Students completing first year requirements for any of Chemistry, Mathematics, or Physics via the three course options (i.e. Chemistry 1010, 1050, 1051, (or 1010, the former 1011, and the former 1031) Mathematics 1090, 1000, 1001, Physics 1020, 1021, 1051) instead of the two course options (Chemistry 1050, 1051, Mathematics 1000, 1001, Physics 1050, 1051) will require the corresponding number of extra credits to obtain an Honours degree.

Under 6 Joint Programs

#### **6.1.12 Chemistry and Earth Sciences Joint Honours**

The following courses, including prerequisites, where applicable, will be required:

1. English 1090 or the former English 1080 and 1110 (or equivalents), Mathematics 1000 and 1001, Earth Sciences 1000 and 1002, CHEM Chemistry 1050 and 1051 (or 1010, the former 1011 and the former 1031) (or 1200 and 1001) or their equivalents, Physics 1050 (or 1020) and 1051 (or 1021).



## Clean Version of Secondary Calendar Changes

### Under 11.3 Chemistry

**1010 Introductory Chemistry I** examines descriptive chemistry; measurements; atoms; molecules; the mole; mole calculations and reaction stoichiometry; the balancing of redox reactions; gases; thermochemistry; introduction to chemical kinetics and equilibrium; acids and bases.

AR: attendance is required in the laboratory component of this course. Failure to attend may result in a failing grade or deregistration from the course.

CR: CHEM 1810

LC: 4

LH: 3 hours biweekly alternating with tutorials

OR: 1.5 hour tutorial alternating with labs

PR: Science 1807. It is recommended that students have successfully completed high school Academic Mathematics 3201, or a pass in any university level mathematics course

UL: only 6 science credit hours will be awarded for a major or honours in Chemistry from the following course groups: CHEM 1010/1050/1051, or CHEM 1810/1200/1001 (Grenfell Campus), or CHEM 1010/the former 1011/the former 1031

**1050 General Chemistry I** builds on basic chemistry concepts from high school. Topics include gases; thermochemistry; atomic structure; periodic properties; chemical bonding including valence bond theory; hybridization and introduction to molecular orbital theory; properties of liquids and solids.

AR: attendance is required in the laboratory component of this course. Failure to attend may result in a failing grade or deregistration from the course.

CR: CHEM 1200

LC: 4

LH: 3

PR: Science 1807; CHEM 1010 with a grade of at least 60% or high school CHEM 3202 with a grade of at least 65%. It is also recommended that students have successfully completed high school Mathematics 3200 or 3201.

UL: only 6 science credit hours will be awarded for a major or honours in Chemistry from the following course groups: CHEM 1010/1050/1051, or CHEM 1810/1200/1001 (Grenfell Campus), or CHEM 1010/the former 1011/the former 1031

**1051 General Chemistry II** builds on CHEM 1050 topics and on basic chemistry concepts from high school. Topics include solutions, kinetics, chemical equilibrium, equilibria involving acids and bases including polyprotic acids, buffers, acid-base indicators, titration curves, solubility and complex ion equilibrium, thermodynamics, and electrochemistry.

AR: attendance is required in the laboratory component of this course. Failure to attend may result in a failing grade or deregistration from the course.

CR: CHEM 1001 and the former CHEM 1011

LC: 4

LH: 3

PR: Science 1807; CHEM 1050 (or Chemistry 1200 with a minimum grade of 65%)

UL: only 6 science credit hours will be awarded for a major or honours in Chemistry from the following course groups: CHEM 1010/1050/1051, or CHEM 1810/1200/1001 (Grenfell Campus), or CHEM 1010/the former 1011/the former 1031

**2400 Introductory Organic Chemistry I** is a course on bonding involving carbon; conformations and stereochemistry; introduction to functional groups and nomenclature; properties, syntheses and reactions of hydrocarbons, alkyl halides, alcohols and ethers.

AR: attendance is required in the laboratory component of this course. Failure to attend may result in a failing grade or deregistration from the course.

CR: the former CHEM 2440

LH: 3

PR: Science 1807; a minimum 60% in CHEM 1051, or CHEM 1001 (or the former CHEM 1031) with a grade of at least 65%

**2610 Introductory Chemical Oceanography** (same as Ocean Sciences 2100) provides an introduction to the fundamental chemical properties of seawater and the processes governing the concentrations of elements and compounds in the oceans. It is an introduction to the sources, distribution, and transformations of chemical constituents of the ocean, and their relation to biological, chemical, geological, and physical processes. Topics include: controls on average concentration of chemicals in the ocean; vertical and horizontal distributions of ocean constituents; air-sea interactions; production, export, and remineralization of organic matter; the ocean carbon cycle; human-induced changes; stable isotopes; and trace elements.

CR: Ocean Sciences 2100

PR: the former CHEM 1011, CHEM 1051 or 1001 which may be taken concurrently

Under 11.9 Ocean Sciences

## **2100**

### **Introductory Chemical Oceanography**

(same as Chemistry 2610) provides an introduction to the fundamental chemical properties of seawater and the processes governing the concentrations of elements and compounds in the oceans. It is an introduction to the sources, distribution, and transformations of chemical constituents of the ocean, and their relation to biological, chemical, geological, and physical processes. Topics include: controls on average concentration of chemicals in the ocean; vertical and horizontal distributions of ocean constituents; air-sea interactions; production, export, and remineralization of organic matter; the ocean carbon cycle; human-induced changes; stable isotopes; and trace elements.

CR: Chemistry 2610

PR: the former CHEM 1011, Chemistry 1051 or 1001 which may be taken concurrently

Under 10.3 Chemistry

### **10.3.3 Minor in Chemistry**

Students who take a minor in Chemistry will complete Chemistry 1050 and 1051 (or 1200 and 1001), Chemistry 2100, 2210, 2301 or 2302, and 2400, and 6 credit hours in other chemistry courses at the 2000 level or above.

#### **10.3.5.1 Required Courses**

2. Chemistry 1050 and 1051 or 1200 and 1001), 2100, 2210, 2301, 2302, 2400, 2401, 3110, 3210, 3211, 3303, 3411, and 490A/B.

#### **10.3.9.2 Other Information**

6. Students completing first year requirements for any of Chemistry, Mathematics, or Physics via the three course options (i.e. Chemistry 1010, 1050, 1051, Mathematics 1090, 1000, 1001, Physics 1020, 1021, 1051) instead of the two course options (Chemistry 1050, 1051, Mathematics 1000, 1001, Physics 1050, 1051) will require the corresponding number of extra credits to obtain an Honours degree.

Under 6 Joint Programs

#### **6.1.12 Chemistry and Earth Sciences Joint Honours**

The following courses, including prerequisites, where applicable, will be required:

2. English 1090 or the former English 1080 and 1110 (or equivalents), Mathematics 1000 and 1001, Earth Sciences 1000 and 1002, Chemistry 1050 and 1051 (or 1200 and 1001)\_or their equivalents, Physics 1050 (or 1020) and 1051 (or 1021).

## **Rationale**

All of the departments in the faculty of Science as well as HKR have chosen to make the University level chemistry courses, 1050 and 1051, their required courses. As such, there is no need for CHEM 1011, and we have decided to delete this course from the calendar. CHEM 1010 is a preparatory course for students entering MUN who do not meet the requirements for CHEM 1050 out of high school.

**Consultations Sought From**

**Comments Received**

<b>Grenfell</b>	<b>no</b>
<b>Marine Institute</b>	<b>yes</b>
<b>Mathematics and Statistics</b>	<b>yes</b>
<b>Computer Science</b>	<b>no</b>
<b>Physics</b>	<b>yes</b>
<b>Biochemistry</b>	<b>yes</b>
<b>Biology</b>	<b>no</b>
<b>Psychology</b>	<b>no</b>
<b>Ocean Sciences</b>	<b>yes</b>
<b>Earth Sciences</b>	<b>no</b>
<b>Pharmacy</b>	<b>no</b>
<b>Engineering</b>	<b>yes</b>
<b>Faculty of Education</b>	<b>yes</b>
<b>Library Report Received</b>	<b>yes</b>

**Signature:** Dean, Associate Vice-President (Academic) or Vice-President

Name

---

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**APPROVAL GRANTED BY SENATE COMMITTEE ON UNDERGRADUATE STUDIES**

Chair:

Secretary:

Date:

**Consultation email**

-----Original Message-----

From: Department of Chemistry Consult [mailto:[chemconsult@mun.ca](mailto:chemconsult@mun.ca)]

Sent: February-22-18 3:32 PM

To: [sdufour@mun.ca](mailto:sdufour@mun.ca); [mpiercey-normore@grenfell.mun.ca](mailto:mpiercey-normore@grenfell.mun.ca);

[MIUGconsultations@mi.mun.ca](mailto:MIUGconsultations@mi.mun.ca); [jmellor@mun.ca](mailto:jmellor@mun.ca); [biohead@mun.ca](mailto:biohead@mun.ca);  
[amercier@mun.ca](mailto:amercier@mun.ca); [psychology.head@mun.ca](mailto:psychology.head@mun.ca); [enrconsult@mun.ca](mailto:enrconsult@mun.ca);  
[pharminfo@mun.ca](mailto:pharminfo@mun.ca); [cs-Chair@mun.ca](mailto:cs-Chair@mun.ca); [physicshead@mun.ca](mailto:physicshead@mun.ca); vbooth <"@mun.ca,  
iljones"@mun.ca>; [sharene@mun.ca](mailto:sharene@mun.ca); [mathconsult@mun.ca](mailto:mathconsult@mun.ca); [cthorpe@mun.ca](mailto:cthorpe@mun.ca);  
[gkundhi@mun.ca](mailto:gkundhi@mun.ca); [ncatto@mun.ca](mailto:ncatto@mun.ca); [fletcher@mun.ca](mailto:fletcher@mun.ca)  
Cc: [jrotchford@mun.ca](mailto:jrotchford@mun.ca); [afoster@mun.ca](mailto:afoster@mun.ca); [tfridgen@mun.ca](mailto:tfridgen@mun.ca)  
Subject: Consultation request for proposal from Chemistry Chem 1011 deletion

Hello Everyone,

I apologize if you receive this request twice. I have been experiencing problems with emailing the group. Please send your comments on chemistry's proposal to chemconsult as your earliest convenience.

Thanks,

Chris Flinn  
Deputy Head, Undergraduate Studies  
Chemistry Department

### **Library report**

Thanks Chris,

This will have no impact on Memorial Libraries.

---

Erin Alcock  
Science Research Liaison Librarian  
QE2 Library  
Memorial University of Newfoundland  
[ekalcock@mun.ca](mailto:ekalcock@mun.ca)  
709-864-8316

On 2018-02-21, 4:51 PM, "Department of Chemistry Consult"  
<[chemconsult@mun.ca](mailto:chemconsult@mun.ca)> wrote:

Hi Erin.

Please review the proposal to delete chemistry 1011 re its effect on the library.

Thanks,

Chris Flinn  
Chemistry

Consultation responses received:

Math and Statistics

No comments from Math & Stats.

Tara

--

Tara Stuckless

HH 3004, ext. 8914

Chair, Undergraduate Studies Committee

Dept. of Mathematics and Statistics

### **Physics**

Dear Chris,

The Department of Physics and Physical Oceanography is fine with the deletion of CHEM1011.

I will note the listing of prerequisites for CHEM2610 Introductory Chemical Oceanography needs a little fixing in both "edited" and "clean" versions.

Also, in the description of CHEM2400 Introductory Organic Chemistry I:

-I'm guessing stereochemistry -> stereochemistry

-space after last comma needed

Cheers,

Ivan

Ivan Saika-Voivod, Associate Professor

Chair, Undergraduate Studies Committee

Department of Physics and Physical Oceanography, Memorial University of Newfoundland

St. John's, NL, Canada, A1B 3X7

Phone: (709) 864-8886 Fax: (709) 864-8739 Room C3026

### **Faculty of Engineering**

Dear Dr. Flinn,

Thank you for the opportunity to comment on the proposal to delete the courses

CHEM 1011 Introductory Chemistry II

and

CHEM 2440 Organic Chemistry for Biologists.

Our students must complete CHEM 1050 during Engineering One (not CHEM 1010/1011). After consulting with some colleagues, I can report that these deletions should have no impact on Engineering programs.

Yours sincerely,

Dr. Glyn George, Chair  
Committee on Undergraduate Studies  
Faculty of Engineering and Applied Science  
Memorial University of Newfoundland  
St. John's NL A1B 3X5

### **Marine Institute**

Dear Chris,

Thank you for the opportunity to review and comment on your proposal for the deletion of CHEM 1011 from your offerings. This will have no impact on Marine Institute programs and we are happy to support the proposal.

Regards,  
Bev

Bev Fleet  
Chair, Undergraduate Studies Committee  
Marine Institute, Memorial University  
TEL: 709-778-0369  
FAX: 709-778-0535  
[Bev.Fleet@mi.mun.ca](mailto:Bev.Fleet@mi.mun.ca)

### **Ocean Sciences**

Hi Chris:

We are fine with the proposed deletion, which was anticipated.

I did note some minor wording issues in the way the PR of Chemistry 2610 were adjusted in the Secondary Changes. The revised description states "PR: 1051 or CHEM which may be taken concurrently" -- I presume you meant to state "CHEM 1051 which may be taken concurrently" (note that both the corrected and clean sections need to be adjusted).

Also, the Secondary Changes section should probably include adjustments to the PR of Ocean Sciences 2100, which is the same as Chemistry 2610 (both calendar sections should be the same). We had CHEM 1001



(Grenfell) in the PR, which I presume can stay? This means the PR for CHEM 2610 could be "CHEM 1051 which may be taken concurrently, or CHEM 1001". And the PR for OCSC 2100 could be "Chemistry 1051 which may be taken concurrently, or Chemistry 1001".

Please let me know if you agree.

All the best,

Annie

---

Annie Mercier, PhD  
Professor and Deputy Head,  
Department of Ocean Sciences  
Memorial University (Ocean Sciences Centre)  
St. John's, NL, Canada, A1C 5S7

### **Response to Ocean Sciences comments**

Hi Annie,

Thank you for catching this.

Since chemistry treats CHEM 1051 and CHEM 1001 almost identically would we be able to do this for OCSC 2100 and CHEM 2610 by stating that the prerequisite is:

PR: Chemistry 1051 or 1001 which may be taken concurrently

Thanks,

Travis

### **Final response from Ocean Sciences**

Hi Travis:

Sounds good to me.

Cheers,

Annie

### **Biochemistry**

Hi Chris,

Biochemistry is OK with the deletion of Chem 1011.

Valerie

## Faculty of Education

Hello Dr. Flinn,

Ms. Judith Mellor is currently on leave so she has forwarded me your requests. Thank you for the opportunity to provide feedback on the following calendar change proposals:

1. Deletion of CHEM 1011
2. Deletion of CHEM 2440

These changes will not directly impact the Faculty of Education's programs.

Thank you,

Meghan

**Meghan Collett, B.Sc., M.Sc. | Coordinator of Undergraduate Programs**

Faculty of Education  
Memorial University of Newfoundland  
St. John's, Newfoundland, Canada A1B 3X8  
G.A.Hickman Building | Room ED 2020

## Associate Dean of Science

Hi Chris,

I may have missed something, but the proposal did not seem to address any of the required secondary changes in the Bachelor of Science in Nutrition (Dietetics Option) agreement between Memorial University and Acadia University.

Andy

**DR. ANDY FOSTER | ASSOCIATE DEAN OF SCIENCE**  
(Administration & Undergraduate)  
Memorial University  
St. John's, NL, Canada A1B 3X7  
T 709-864-8155

## Proposal Deletion of CHEM 2440

### Executive Summary

Chemistry 2440 is to be deleted from the calendar.

### Resource Implications: Instructional Costs

There should be no net resource implications, positive or negative. Students will still need to take organic chemistry, but instead of 2440 students will take either CHEM 2400 or 2400 and 2401.

### Library Holdings and/or Other Resources Required

There are no added library costs associated with the new course.

Signature of Unit Head (if appropriate): \_\_\_\_\_

Date: \_\_\_\_\_

Signature of Dean/Associate Vice-President (Academic)/Vice-President: \_\_\_\_\_

Date: \_\_\_\_\_

## SUMMARY PAGE FOR SENATE

### Approval Form

#### Edits:

#### Calendar Entries

Under 11.3 Chemistry

~~**2440 Organic Chemistry for Biologists** is an introduction to the principles of organic chemistry with an emphasis on material relevant to biological molecules. The laboratory will introduce techniques and illustrate concepts covered in the course. This course is designed primarily for Biology Majors.~~

~~AR: attendance is required in the laboratory component of this course. Failure to attend may result in a failing grade or deregistration from the course.~~

~~CR: CHEM 2400~~

~~LH: 3~~

~~PR: Science 1807; CHEM 1051 or a minimum 60% in CHEM 1011~~

~~UL: may not be used for credit by Chemistry or Biochemistry Majors and will not serve as a prerequisite for any other Chemistry course.~~

#### Clean Version

## Secondary Calendar Changes

No secondary calendar changes. All calendar changes in other departments and joint programs have already been applied by removing the requirement of CHEM 2440 and requiring either 2400 or 2400 and 2401.

## Rationale

An important requirement of the new PHARM D program at the MUN School of Pharmacy is a greater level of knowledge of organic chemistry than that provided by CHEM 2440. Hence the new PHARM D program has replaced CHEM 2440 with CHEM 2400 and 2401. This has reduced the demand for this course from an average of 275 students from 2014 to 2016 over two semesters to 190 over two semesters in 2017. Talks with Biology revealed that they would prefer their students take 2 terms of organic chemistry and have opted for the CHEM 2400/2401 set of courses. A number of other departments have indicated that they prefer retention of CHEM 2440 but have agreed to replace CHEM 2440 with CHEM 2400 (e.g. Biochemistry Nutrition) or have dropped their requirement for organic chemistry (Behavioural Neuroscience). Hence there will be no demand for CHEM 2440 in 2019/20. We therefore propose the deletion of the course.

Since this proposal, one to delete CHEM 1011, and Biology's proposal to avail of 1050/1051/2400/2401 will be in the 2019/20 calendar, students next year will need to be told that 2440 will not exist. This will be done with a carefully and concisely worded note in the comments page for registration of 1010 and 1011. We will also e-mail students registered for 1010 during registration in the fall so that students know that if they take 1010 it is for preparation. Similarly, any students who register for 1011 in the winter will be informed that they should be taking 1050. Finally Chemistry will consider offering CHEM 2440 for the last time in the Spring semester of 2019.

Consultations Sought From	Comments Received
Grenfell	no
Marine Institute	yes
Mathematics and Statistics	yes
Computer Science	no
Physics	yes
Biochemistry	yes
Biology	no
Psychology	no
Ocean Sciences	yes
Earth Sciences	no
Pharmacy	no
Engineering	no
Faculty of Education	yes
Library Report Received	yes

Signature: Dean, Associate Vice-President (Academic) or Vice-President

Name

---

FOR OFFICE USE ONLY

APPROVAL GRANTED BY SENATE COMMITTEE ON UNDERGRADUATE STUDIES

Chair:

Secretary:

Date:

**Consultation email:**

from: Department of Chemistry Consult [mailto:[chemconsult@mun.ca](mailto:chemconsult@mun.ca)]

Sent: February-23-18 11:31 AM

To: [sdufour@mun.ca](mailto:sdufour@mun.ca); [mpiercey-normore@grenfell.mun.ca](mailto:mpiercey-normore@grenfell.mun.ca);  
[MIUGconsultations@mi.mun.ca](mailto:MIUGconsultations@mi.mun.ca); [jmellor@mun.ca](mailto:jmellor@mun.ca); [biohead@mun.ca](mailto:biohead@mun.ca);  
[amercier@mun.ca](mailto:amercier@mun.ca); [psychology.head@mun.ca](mailto:psychology.head@mun.ca); [engrconsult@mun.ca](mailto:engrconsult@mun.ca);  
[pharminfo@mun.ca](mailto:pharminfo@mun.ca); [cs-Chair@mun.ca](mailto:cs-Chair@mun.ca); [physicshead@mun.ca](mailto:physicshead@mun.ca); vbooth <"@mun.ca,  
iljones"@mun.ca>; [sharene@mun.ca](mailto:sharene@mun.ca); [mathconsult@mun.ca](mailto:mathconsult@mun.ca); [cthorpe@mun.ca](mailto:cthorpe@mun.ca);

[gkundhi@mun.ca](mailto:gkundhi@mun.ca); [ncatto@mun.ca](mailto:ncatto@mun.ca); [fletcher@mun.ca](mailto:fletcher@mun.ca)

Cc: [jrotchford@mun.ca](mailto:jrotchford@mun.ca); [afoster@mun.ca](mailto:afoster@mun.ca); [tfridgen@mun.ca](mailto:tfridgen@mun.ca)

Subject: Consultations on a proposal to delete Chemistry 2440 from our course offerings

Hello everyone,

I would like your comments on the proposal to delete chemistry 2440 from our course offerings at your earliest convenience. I apologize if any of you received this email previously. I had problems sending a group email but some of you may still have received my first email.

Sincerely,

Chris Flinn  
Deputy Head, Undergraduate Studies  
Chemistry Department

### **Library report**

Chris,

This change will have no impact on Memorial Libraries.

---

Erin Alcock  
Science Research Liaison Librarian  
QE2 Library  
Memorial University of Newfoundland  
[ekalcock@mun.ca](mailto:ekalcock@mun.ca)  
709-864-8316

On 2018-02-21, 4:54 PM, "Department of Chemistry Consult"  
<[chemconsult@mun.ca](mailto:chemconsult@mun.ca)> wrote:

Hi Erin,

Please review the proposal to delete chemistry 2440 regarding its effect on the library.

Thanks,

Chris Flinn  
Chemistry

Consultation Feedback

Education

Hello Dr. Flinn,

Ms. Judith Mellor is currently on leave so she has forwarded me your requests. Thank you for the opportunity to provide feedback on the following calendar change proposals:

1. Deletion of CHEM 1011
2. Deletion of CHEM 2440

These changes will not directly impact the Faculty of Education's programs.

Thank you,

Meghan

**Meghan Collett, B.Sc., M.Sc. | Coordinator of Undergraduate Programs**

Faculty of Education  
Memorial University of Newfoundland  
St. John's, Newfoundland, Canada A1B 3X8  
G.A.Hickman Building | Room ED 2020

Math and Statistics

No comments from Math & Stats.

Tara Stuckless  
HH 3004, ext. 8914  
Chair, Undergraduate Studies Committee  
Dept. of Mathematics and Statistics

**Physics**

Dear Chris,



The Department of Physics and Physical Oceanography is fine with the deletion of CHEM2440.

Cheers,  
Ivan

Ivan Saika-Voivod, Associate Professor  
Chair, Undergraduate Studies Committee  
Department of Physics and Physical Oceanography, Memorial University of Newfoundland  
St. John's, NL, Canada, A1B 3X7  
Phone: (709) 864-8886 Fax: (709) 864-8739 Room C3026

On 2018-02-23, at 12:09 PM, Physics Head wrote:

Ivan,

For your and USC consideration. I have no problem with this.  
Jolanta

### **Marine Institute**

Dear Chris,

Thank you for the opportunity to review and comment on your proposal for the deletion of CHEM 2440 from your offerings. This will have no impact on Marine Institute programs and we are happy to support the proposal.

Regards,  
Bev

Bev Fleet  
Chair, Undergraduate Studies Committee  
Marine Institute, Memorial University  
TEL: 709-778-0369  
FAX: 709-778-0535  
[Bev.Fleet@mi.mun.ca](mailto:Bev.Fleet@mi.mun.ca)

### **Ocean Sciences**

Hi Chris:

Our undergrad committee agrees with the proposed deletion of 2440.

All the best,

Annie

---

Annie Mercier, PhD  
Professor and Deputy Head,  
Department of Ocean Sciences  
Memorial University (Ocean Sciences Centre)  
St. John's, NL, Canada, A1C 5S7  
Tel: (709) 864-2011  
Email: [amercier@mun.ca](mailto:amercier@mun.ca)  
[www.mun.ca/osc/amercier/bio.php](http://www.mun.ca/osc/amercier/bio.php)

### **Biochemistry**

Hi Chris,

Losing Chem 2440 is not ideal from the point-of-view of our nutrition program since a one-semester "Organic Chemistry for Life Sciences" course is the norm for similar programs and is the preference of our nutrition faculty.

However, if my understanding is correct that both Chem 2400 and Chem 2401 are going to be offered twice a year going forward, on balance these two changes are probably better overall for students in our department's programs and we can live with the loss of Chem 2440 in our nutrition programs.

Best,

Valerie

.....  
Valerie Booth  
Professor  
Deputy Head (undergraduate) Department of Biochemistry and  
Department of Physics and Physical Oceanography  
Memorial University of Newfoundland  
St. John's, NL, A1B 3X9, Canada

## **Proposal Calendar Changes to Existing Course OCSC 2500**

### **Executive summary**

OCSC 2500 (Introduction to Practical Ocean Sciences) is a core course for the Majors offered by the Department of Ocean Sciences. We propose a minor modification to the prerequisites of the course to make sure students can access the course through a more flexible and coherent route that includes a choice of three among the five 2000-level introductory courses in Ocean Sciences.

### **Resource implications**

There will be no resource implications, and no additional costs associated with this change.

### **Consultations**

See Appendix.

### **Library Holdings and/or Other Resources Required**

There will no need to change library resources or other existing resources.

Signature of Unit Head

---

Date

---

Signature of the Dean

---

Date

---

## SUMMARY PAGE FOR SENATE Approval Form

### Course number and title

OCSC 2500 Introduction to Practical Ocean Sciences

### Proposed Calendar Changes under 11.9 Ocean Sciences

**2500 Introduction to Practical Ocean Sciences** explores the instruments, techniques and analytical methods commonly used to study marine life and processes, chiefly focusing on the interaction between living organisms and their chemical, physical and geological environment. The course combines ship-based or shore-based sampling and data collection with laboratory investigation in an intensive 2-week long format. It is primarily intended for mid-level undergraduate students majoring in Ocean Sciences. This course will either be offered during a special session following the Winter semester, or in the Spring semester.

AR: attendance is required. Failure to attend may result in a failing grade or withdrawal from the course.

PR: Science 1807; OCSC 1000, and at least three of OCSC 2000 (or Biology 3710), [2001](#), 2100, 2200, 2300

### Clean Calendar Entry under 11.9 Ocean Sciences

**2500 Introduction to Practical Ocean Sciences** explores the instruments, techniques and analytical methods commonly used to study marine life and processes, chiefly focusing on the interaction between living organisms and their chemical, physical and geological environment. The course combines ship-based or shore-based sampling and data collection with laboratory investigation in an intensive 2-week long format. It is primarily intended for mid-level undergraduate students majoring in Ocean Sciences. This course will either be offered during a special session following the Winter semester, or in the Spring semester.

AR: attendance is required. Failure to attend may result in a failing grade or withdrawal from the course.

PR: Science 1807; OCSC 1000, and at least three of OCSC 2000 (or Biology 3710), 2001, 2100, 2200, 2300

### Rationale for Change

Adding OCSC 2001 to the choice of prerequisites essentially corrects an oversight, so that completion of any three of the Department's five 2000-level introductory courses in Ocean Sciences grants access to the mandatory practical course OCSC 2500, which students normally take at the end of the fourth semester (intersession or Spring semester).

**Consultations Sought From**

**Comments Received**

1. Marine Institute	Yes
2. Grenfell campus	No
3. Department of Biochemistry	Yes
4. Department of Biology	Yes
5. Department of Chemistry	Yes
6. Department of Computer Sciences	No
7. Department of Earth Sciences	No
8. Department of Economics	No
9. Department of Geography	Yes
10. Department of Mathematics and Statistics	Yes
11. Department of Physics and Physical Oceanography	Yes
12. Department of Psychology	No
13. Faculty of Business Administration	No
14. Faculty of Engineering and Applied Science	Yes
15. Faculty of Education	No
16. Faculty of Arts	No
17. School of Medicine	Yes

Library Report Received NA

**Approved by Dean, Associate Vice-President (Academic) or Vice President Yes / No**

Name \_\_\_\_\_

**APPROVAL GRANTED BY SENATE COMMITTEE ON UNDERGRADUATE STUDIES**

Chair: \_\_\_\_\_

Secretary: \_\_\_\_\_

Date: \_\_\_\_\_

## APPENDIX – CONSULTATIONS

### Message sent on Feb 28, 2018

**Subject:**Calendar change to existing course OCSC 2500

**Date:** Wed, 28 Feb 2018 16:46:05 +0000

**From:** Fletcher, Garth <fletcher@mun.ca>

**To:** Biochemistry Head <biohead@mun.ca>, Business <fba.ad.undergrad@mun.ca>, chemconsult@mun.ca (chemconsult@mun.ca) <chemconsult@mun.ca>, 'cs-chair@mun.ca' <cs-chair@mun.ca>, Earth Sciences <eascugcon@mun.ca>, Locke, Wade <wlocke@mun.ca>, Hicks, Sue <shicks@mun.ca>, Engineering <enrconsult@mun.ca>, Grenfell Campus <associatevpoffice@grenfell.mun.ca>, Faculty of Humanities and Social Sciences <hss@mun.ca>, 'Ian Neath' <Psychology.Head@mun.ca>, Jody-Lynn Burke <jrotchford@mun.ca>, Lagowski, Jolanta <jolantal@mun.ca>, Marino, Paul <pmarino@mun.ca>, 'mathconsult@mun.ca' <mathconsult@mun.ca>, Medicine <deanofmedicine@med.mun.ca>, 'miugconsultations@mi.mun.ca' <miugconsultations@mi.mun.ca>, Catto, Norm <ncatto@mun.ca>

**CC:** Foster, Andy <afoster@mun.ca>, amercier@mun.ca <amercier@mun.ca>

Colleagues, Could you please review the proposed calendar change and send responses to me at your earliest convenience.

Regards

Garth

Garth L. Fletcher  
Head and Professor Emeritus  
Department of Ocean Sciences  
Ocean Sciences Centre  
Memorial University  
St John's NL  
Canada, A1C 5S7

TEL: 709-864-3276

FAX 709-864-3220

Email [fletcher@mun.ca](mailto:fletcher@mun.ca)

**Feedback received**

**GEOGRAPHY**

**From:** Catto, Norm  
**Sent:** February-28-18 1:29 PM  
**To:** Fletcher, Garth <[fletcher@mun.ca](mailto:fletcher@mun.ca)>  
**Subject:** RE: Calendar change to existing course OCSC 2500

No issues from me

Norm Catto  
Head, Department of Geography  
Memorial University  
St. John's NL A1B 3X9  
Canada  
1-709-864-7463  
Fax 1-709-864-3119

**MATHEMATICS**

**From:** Math Consult [<mailto:mathconsult@mun.ca>]  
**Sent:** March-01-18 11:04 AM  
**To:** Fletcher, Garth <[fletcher@mun.ca](mailto:fletcher@mun.ca)>  
**Subject:** RE: Calendar change to existing course OCSC 2500

No comments.

--

Tara Stuckless  
HH 3004, ext. 8914  
Chair, Undergraduate Studies Committee  
Dept. of Mathematics and Statistics

**ENGINEERING**

**From:** Engineering Consult [<mailto:engrconsult@mun.ca>]  
**Sent:** March-01-18 1:01 PM  
**To:** Fletcher, Garth <[fletcher@mun.ca](mailto:fletcher@mun.ca)>  
**Cc:** Fisher, Andrew <[adfischer@mun.ca](mailto:adfischer@mun.ca)>; Howard Heys <[hheys@mun.ca](mailto:hheys@mun.ca)>; Edmunds, Jayde <[edmundsj@mun.ca](mailto:edmundsj@mun.ca)>  
**Subject:** Re: Calendar change to existing course OCSC 2500

Dear Dr. Fletcher,

Thank you for the opportunity to comment on the proposal to add an alternate prerequisite to

OCSC 2500 Introduction to Practical Ocean Sciences and to create a new course  
OCSC 4940 Special Topics in Immunobiology of Aquatic Organisms

These Calendar changes should have no impact on Engineering programs.

Yours sincerely,

Dr. Glyn George, Chair  
Committee on Undergraduate Studies  
Faculty of Engineering and Applied Science Memorial University of Newfoundland  
St. John's NL A1B 3X5

## **BIOCHEMISTRY**

**From:** Valerie Booth [mailto:vbooth@mun.ca]  
**Sent:** March-01-18 3:41 PM  
**To:** Fletcher, Garth <fletcher@mun.ca>  
**Cc:** Biochemistry Head <biohead@mun.ca>  
**Subject:** Re: Calendar change to existing course OCSC 2500

Hi Garth,

Biochemistry is OK with this change.

Valerie

.....  
Valerie Booth  
Professor  
Deputy Head (undergraduate) Department of Biochemistry and  
Department of Physics and Physical Oceanography  
Memorial University of Newfoundland  
St. John's, NL, A1B 3X9, Canada

phone 709 864-4523 fax: 709 864-2422

homepage: <http://www.faculty.mun.ca/vbooth/>

## **PHYSICS**

**From:** Ivan Saika-Voivod [mailto:saika@mun.ca]  
**Sent:** March-02-18 11:45 AM  
**To:** Fletcher, Garth <fletcher@mun.ca>  
**Cc:** rgouldng <rgoulding@mun.ca>; Lagowski, Jolanta <jolantal@mun.ca>  
**Subject:** Re: Calendar change to existing course OCSC 2500



Dear Garth,

The Department of Physics and Physical Oceanography is supportive of the changes to the prerequisites for OCSC 2500.

We only have a question as to what is usual done in cases where courses listed as prerequisites are the "same as" some other course. Is it necessary to indicate the Chemistry, Earth Sciences and Physics equivalents to OSC 2100, 2200 and 2300?

Best,  
Ivan

Dr. Ivan Saika-Voivod, Associate Professor  
Department of Physics and Physical Oceanography, Memorial University of Newfoundland  
Tel: 709-864-8886, Fax: 709-864-8739, <http://www.physics.mun.ca/~saika/>

On 05/03/2018 7:36 AM, Annie Mercier wrote:

Dear Ivan:

Good point. I asked Shannon to make sure, and he indicated that, while we can certainly be explicit in the calendar language, it is not necessary in these cases because, technically, equivalent courses can be used interchangeably for registration purposes. They are acceptable by default. For the present proposal, we will not change the language because we have not indicated course equivalents in our other listings. However, we might revisit this in the future for all our course PRs.

Many thanks,  
Annie

On 02/03/2018 12:18 PM, Fletcher, Garth wrote:

Thanks for your thoughts Ivan. I will pass them on to Annie Mercier and our undergraduate studies committee.

Regards  
Garth

## **MEDICINE**

**From:** cvardy@mun.ca [mailto:cvardy@mun.ca]  
**Sent:** March-02-18 2:55 PM  
**To:** Fletcher, Garth <fletcher@mun.ca>  
**Subject:** RE: Calendar change to existing course OCSC 2500

Dear Dr. Fletcher

The Faculty of Medicine supports the proposed calendar changes to existing course OCSC 2500.

Regards

Cathy Vardy

CATHY VARDY, MD, FRCPC | VICE DEAN AND PROFESSOR OF PEDIATRICS

Faculty of Medicine  
Health Sciences Centre  
Room M2M319  
Memorial University of Newfoundland  
St. John's, Newfoundland | A1B 3V6

T 709 864 6417 | F 709 864 6336

[www.med.mun.ca/](http://www.med.mun.ca/)

## MARINE INSTITUTE

**From:** MIUG Consultations [mailto:MIUGconsultations@mi.mun.ca]

**Sent:** March-07-18 8:14 AM

**To:** Fletcher, Garth <fletcher@mun.ca>

**Subject:** RE: Calendar change to existing course OCSC 2500

Dear Garth,

Thank you for the opportunity to review and comment on your proposal for the calendar change to existing course OCSC 2500. We are happy to support the proposal.

Regards,  
Bev

Bev Fleet  
Chair, Undergraduate Studies Committee  
Marine Institute, Memorial University  
TEL: 709-778-0369  
FAX: 709-778-0535  
[Bev.Fleet@mi.mun.ca](mailto:Bev.Fleet@mi.mun.ca)

## CHEMISTRY

**From:** Department of Chemistry Consult [[chemconsult@mun.ca](mailto:chemconsult@mun.ca)]

**Sent:** Friday, March 9, 2018 4:57 PM

**To:** Fletcher, Garth

**Subject:** Re: Calendar change to existing course OCSC 2500

Hi Garth,

The course involves sampling and use of analytical chemistry techniques. I would think that that the chemical oceanography course would be required or at least highly recommended.

Chris Flinn

**BIOLOGY**

**From:** Suzanne Dufour [<mailto:sdufour@mun.ca>]  
**Sent:** March-16-18 3:06 PM  
**To:** Fletcher, Garth <[fletcher@mun.ca](mailto:fletcher@mun.ca)>  
**Subject:** Fwd: FW: New course proposal OCSC 4940

Hello Garth,

The Biology Undergraduate Committee has reviewed the proposed change to OCSC 2500 as well as the new proposed course, OCSC 4940.

We have no concerns regarding the addition of a possible prerequisite for OCSC 2500.

Thanks,  
Suzanne

# Proposal for New Special Topics Course in Immunobiology of Aquatic Organisms

## Executive Summary

This is a proposal for a new Special Topics course in Immunobiology of Aquatic Organisms, which will focus on topics relevant to comparative immunology, response to infectious diseases in marine organisms, and fish vaccinology.

## Resource Implications: Instructional Costs

Since this new course will be taught by existing faculty members at the Department of Ocean Sciences, no additional instructional costs are required.

## Consultations

See Appendix.

## Library Holdings and/or Other Resources Required

There are no added library costs associated with the new courses.

Signature of Unit Head (if appropriate): \_\_\_\_\_

Date: \_\_\_\_\_

Signature of Dean/Associate Vice-President (Academic)/Vice-President: \_\_\_\_\_

Date: \_\_\_\_\_

## Sample Course Outline and Method of Evaluation

### Proposed Course Outline

#### I. Introduction to Comparative Immunology

**Week 1:** Immune Biology: innate immune response and antigen recognition

**Week 2:** Diversity and development of antigen receptors in mature lymphocytes

**Week 3:** The immune system in action during and after infection

**Week 4:** Immune system of other vertebrates (other mammals, birds, and reptiles) and origin of the adaptive immune system

**Week 5: Exam 1**

#### II. Immunology of Aquatic Invertebrates.

**Week 6:** Immunoreceptors and cell signaling in aquatic invertebrates

**Oral Presentations (Group 1)**

**Week 7:** Innate immune response in marine invertebrates

**Oral Presentations**

**Week 8: Exam 2**

#### III. Immunology of Aquatic Vertebrates

**Week 9:** Teleost immune system

**Week 10:** Elasmobranches immune system

**Oral Presentations**

**Week 11:** Agnatha immune system

**Oral Presentations (Group 2)**

**Week 12: Exam 3**

**Assignment 1**

#### IV. Fish Vaccinology

**Week 13:** Introduction to vaccinology and mucosal immunity

Fish vaccinology and vaccine design

**Oral Presentations (Group 3)**

**Week 14: Final examination**

#### Format

Lecture format: 3 hours per week, divided into two 1.5 h lectures per week

Laboratory: This course does not have a laboratory component

#### Evaluation

Exam 1 (20%)

Exam 2 (20%)

Exam 3 (20%)

Final Exam (20%)

Assignment (10%); Specific topics for the assignment will be provided during the second week.

Oral presentation (10%); Specific topics will be assigned 3 weeks before oral presentation.

#### Bibliography (the books listed will be placed on reserve at the library)

- Janeway's Immunobiology, 9th edition, 2016. Kenneth Murphy and Casey Weaver. Garland Science.

- Amphioxus Immunity, Tracing the Origins of Human Immunity, 2015. Anlong Xu. Academic Press, London.
- Origin and Evolution of the Vertebrate Immune System, 1999. L. Du Pasquier and GW Litman. Springer.
- Immunobiology of the skink. 2007. SL Smith, RB Sim, MF Flajnik.. CRC Press
- Fish Vaccination. 2014. Roar Gudding, Atle Lillehaug and Øystein Evensen. Wiley Blackwell.
- Invertebrate Medicine. Lewbart, G.A. 2006 Blackwell Publishing Ltd. Victoria, Australia.
- Immunological function in marine invertebrates: Responses to environmental perturbation Fish & Shellfish Immunology 30 (2011) 1209e1222

### **Instructors**

Dr. Javier Santander, Assistant Professor, Department of Ocean Sciences.

Email: [jsantander@mun.ca](mailto:jsantander@mun.ca)

Dr. Matt Rise, Professor, Department of Ocean Sciences.

Email: [mrise@mun.ca](mailto:mrise@mun.ca)

**SUMMARY PAGE FOR SENATE  
Approval Form**

**Course Number and Title**

OCSC 4940 Special Topics in Immunobiology of Aquatic Organisms

**Abbreviated Course Title**

Sp Top Aquatic Immunobiology

**Calendar Changes under 11.9 Ocean Sciences (new entry)**

**4940 Special Topics in Immunobiology of Aquatic Organisms** provides an overview of immunology of aquatic organisms. The focus is on comparative immunology, immune response to infections and environmental stressors (e.g. temperature, pollutants), and vaccinology of commercially cultured fish species. This course also covers topics related to the origin of adaptive immunity, antigen recognition and antibody diversity, memory immune response, and vaccine development.

PR: Biology 2060 (or Biology 2250, or Biochemistry 2100, or both Biochemistry 2200 and 2091). Biology 2060 is recommended.

**Rationale**

The undergraduate programs at the Department of Ocean Sciences would greatly benefit from an elective Special Topics course in Immunobiology of Aquatic Organisms. This elective course is also novel; there is currently no course in immunobiology of aquatic organisms listed in the calendar and no other course at Memorial University that covers comparative immunology of aquatic organisms and fish vaccinology. This course is intended to be broad in scope, touching on aspects of the biology and evolution of aquatic organisms, but will also integrate aquaculture applications. Because it explores the immune system of marine organisms and aquaculture research, the proposed course will be a recommended elective in the undergraduate programs offered by the Department of Ocean Sciences.

**Consultations Sought From**

**Comments Received**

Marine Institute	Yes
Grenfell campus	No
Department of Biochemistry	Yes
Department of Biology	Yes
Department of Chemistry	Yes
Department of Computer Sciences	No
Department of Earth Sciences	Yes
Department of Economics	No
Department of Geography	Yes
Department of Mathematics and Statistics	Yes
Department of Physics and Physical Oceanography	Yes
Department of Psychology	No
Faculty of Arts	No
Faculty of Education	No
Faculty of Engineering and Applied Science	Yes
School of Medicine	Yes

**Library Report Received**

No

**Approved by Dean, Associate Vice-President (Academic) or Vice President** Yes / No

Name \_\_\_\_\_

---

**FOR OFFICE USE ONLY**

**APPROVAL GRANTED BY SENATE COMMITTEE ON GRADUATE STUDIES**

Chair: \_\_\_\_\_

Secretary: \_\_\_\_\_

Date: \_\_\_\_\_



## APPENDIX – CONSULTATIONS

### Message sent on Feb 28, 2018

**Subject:** New course proposal OCSC 4940  
**Date:** Wed, 28 Feb 2018 16:57:18 +0000  
**From:** Fletcher, Garth <fletcher@mun.ca>  
**To:** Biochemistry Head <biohead@mun.ca>, Business <fba.ad.undergrad@mun.ca>, chemconsult@mun.ca (chemconsult@mun.ca) <chemconsult@mun.ca>, 'cs-chair@mun.ca' <cs-chair@mun.ca>, Earth Sciences <eascugcon@mun.ca>, Locke, Wade <wlocke@mun.ca>, Hicks, Sue <shicks@mun.ca>, Engineering <engrconsult@mun.ca>, Alcock, Erin <ekalcock@mun.ca>, Grenfell Campus <associatevpoffice@grenfell.mun.ca>, Faculty of Humanities and Social Sciences <hss@mun.ca>, 'Ian Neath' <Psychology.Head@mun.ca>, Jody-Lynn Burke <jrotchford@mun.ca>, Lagowski, Jolanta <jolantal@mun.ca>, Marino, Paul <pmarino@mun.ca>, 'mathconsult@mun.ca' <mathconsult@mun.ca>, Medicine <deanofmedicine@med.mun.ca>, 'miugconsultations@mi.mun.ca' <miugconsultations@mi.mun.ca>, Catto, Norm <ncatto@mun.ca>  
**CC:** amercier@mun.ca <amercier@mun.ca>, Foster, Andy <afoster@mun.ca>

Colleagues, Ocean Sciences is proposing to offer a new special topics course in Immunobiology of aquatic organisms.

Please review the attached proposal and return your comments to me at your earliest convenience.

Regards

Garth

Garth L. Fletcher  
Head and Professor Emeritus  
Department of Ocean Sciences  
Ocean Sciences Centre  
Memorial University  
St John's NL  
Canada, A1C 5S7

TEL: 709-864-3276

FAX 709-864-3220

Email [fletcher@mun.ca](mailto:fletcher@mun.ca)

## **Feedback received**

### **GEOGRAPHY**

**From:** Catto, Norm

**Sent:** February-28-18 1:45 PM

**To:** Fletcher, Garth <fletcher@mun.ca>; Biochemistry Head <biohead@mun.ca>; Business <fba.ad.undergrad@mun.ca>; chemconsult@mun.ca (chemconsult@mun.ca) <chemconsult@mun.ca>; 'cs-chair@mun.ca' <cs-chair@mun.ca>; Earth Sciences <eascugcon@mun.ca>; Locke, Wade <wlocke@mun.ca>; Hicks, Sue <shicks@mun.ca>; Engineering <engrconsult@mun.ca>; Alcock, Erin <ekalcock@mun.ca>; Grenfell Campus <associatevpoffice@grenfell.mun.ca>; Faculty of Humanities and Social Sciences <hss@mun.ca>; 'Ian Neath' <Psychology.Head@mun.ca>; Jody-Lynn Burke <jrotchford@mun.ca>; Lagowski, Jolanta <jolantal@mun.ca>; Marino, Paul <pmarino@mun.ca>; 'mathconsult@mun.ca' <mathconsult@mun.ca>; Medicine <deanofmedicine@med.mun.ca>; 'miugconsultations@mi.mun.ca' <miugconsultations@mi.mun.ca>

**Cc:** amercier@mun.ca; Foster, Andy <afoster@mun.ca>

**Subject:** RE: New course proposal OCSC 4940

No issues

Norm Catto  
Head, Department of Geography  
Memorial University  
St. John's NL A1B 3X9  
Canada  
1-709-864-7463  
Fax 1-709-864-3119

### **EARTH SCIENCES**

**From:** UGradMattersES [mailto:eascugcon@mun.ca]

**Sent:** February-28-18 2:10 PM

**To:** Fletcher, Garth <fletcher@mun.ca>

**Subject:** Re: New course proposal OCSC 4940

No issues from Earth Science either.

All the best,

KIM...

### **MATHEMATICS**

**From:** Math Consult [mailto:mathconsult@mun.ca]

**Sent:** March-01-18 11:02 AM

**To:** Fletcher, Garth <fletcher@mun.ca>  
**Subject:** RE: New course proposal OCSC 4940

No comments. -Tara

--

Tara Stuckless  
HH 3004, ext. 8914  
Chair, Undergraduate Studies Committee  
Dept. of Mathematics and Statistics

## ENGINEERING

**From:** Engineering Consult [<mailto:enrconsult@mun.ca>]  
**Sent:** March-01-18 1:01 PM  
**To:** Fletcher, Garth <fletcher@mun.ca>  
**Cc:** Fisher, Andrew <adfischer@mun.ca>; Howard Heys <hheys@mun.ca>; Edmunds, Jayde <edmundsj@mun.ca>  
**Subject:** Re: Calendar change to existing course OCSC 2500

Dear Dr. Fletcher,

Thank you for the opportunity to comment on the proposal to add an alternate prerequisite to OCSC 2500 Introduction to Practical Ocean Sciences and to create a new course OCSC 4940 Special Topics in Immunobiology of Aquatic Organisms

These Calendar changes should have no impact on Engineering programs.

Yours sincerely,

Dr. Glyn George, Chair  
Committee on Undergraduate Studies  
Faculty of Engineering and Applied Science Memorial University of Newfoundland  
St. John's NL A1B 3X5

## BIOCHEMISTRY

**From:** Valerie Booth [<mailto:vbooth@mun.ca>]  
**Sent:** March-01-18 3:41 PM  
**To:** Fletcher, Garth <fletcher@mun.ca>  
**Cc:** Biochemistry Head <biohead@mun.ca>  
**Subject:** Re: New course proposal OCSC 4940

Hi Garth,

Biochemistry is generally in support of this new course. I do have a couple of questions:

1. In the course outline I'm confused by the oral presentation evaluation. Are there 3 presentations worth 10% each as the top two-thirds of the page seems to suggest or are they to be worth 10% overall as suggested by the section near the bottom of the page?

2. Would you consider adding Biochemistry 2200 as an additional option for the pre-requisite? This is our newly approved course that is identical to Bioc 2100 except doesn't have a lab component.

Best,

Valerie

On 02/03/2018 7:43 AM, Annie Mercier wrote:

Hi Valerie:

Many thanks for the feedback. We will ask the instructors to make sure the evaluation scheme is clear. As for adding BIOC 2200 as a PR, I had already made a note after reading your documentation earlier this week, and I believe it makes perfect sense.

All the best,

Annie

On 01/03/2018 4:35 PM, Fletcher, Garth wrote:

Thanks Valerie, I am passing your questions and suggestion on to Annie Mercier and our undergraduate studies committee.

Regards

Garth

## PHYSICS

**From:** Ivan Saika-Voivod [mailto:saika@mun.ca]

**Sent:** March-02-18 11:10 AM

**To:** Fletcher, Garth <fletcher@mun.ca>

**Cc:** rgouldng <rgoulding@mun.ca>; Lagowski, Jolanta <jolantal@mun.ca>

**Subject:** Re: New course proposal OCSC 4940

Dear Garth,

The Department of Physics and Physical Oceanography is supportive of this new special topics course.

Best,

Dr. Ivan Saika-Voivod, Associate Professor

Department of Physics and Physical Oceanography, Memorial University of Newfoundland

Tel: 709-864-8886, Fax: 709-864-8739, <http://www.physics.mun.ca/~saika/>

## MEDICINE

**From:** cvardy@mun.ca [mailto:cvardy@mun.ca]  
**Sent:** March-02-18 2:57 PM  
**To:** Fletcher, Garth <fletcher@mun.ca>  
**Subject:** RE: New course proposal OCSC 4940

Dear Dr. Fletcher

The Faculty of Medicine supports the proposal for a new special topics course in Immunobiology of Aquatic Organisms.

Regards  
Cathy Vardy

CATHY VARDY, MD, FRCPC | VICE DEAN AND PROFESSOR OF PEDIATRICS

Faculty of Medicine  
Health Sciences Centre

Room M2M319

Memorial University of Newfoundland  
St. John's, Newfoundland | A1B 3V6

T 709 864 6417 | F 709 864 6336  
www.med.mun.ca/

## MARINE INSTITUTE

**From:** MIUG Consultations [<mailto:MIUGconsultations@mi.mun.ca>]  
**Sent:** March-07-18 8:13 AM  
**To:** Fletcher, Garth <[fletcher@mun.ca](mailto:fletcher@mun.ca)>  
**Subject:** RE: New course proposal OCSC 4940

Dear Garth,

Thank you for the opportunity to review and comment on your proposal for the new special topics course in Immunobiology of Aquatic Organisms (OCSC 4940). We are happy to support the proposal.

Regards,  
Bev

Bev Fleet  
Chair, Undergraduate Studies Committee  
Marine Institute, Memorial University  
TEL: 709-778-0369  
FAX: 709-778-0535

[Bev.Fleet@mi.mun.ca](mailto:Bev.Fleet@mi.mun.ca)

## CHEMISTRY

**From:** Department of Chemistry Consult  
**Sent:** Friday, March 9, 2018 4:38 PM  
**To:** Fletcher, Garth  
**Subject:** Re: New course proposal OCSC 4940

Hello Garth,

Chemistry has no issues. The course sounds very interesting.

Chris Flinn  
Chemistry

## BIOLOGY

**From:** Suzanne Dufour [<mailto:sdufour@mun.ca>]  
**Sent:** March-16-18 3:06 PM  
**To:** Fletcher, Garth <[fletcher@mun.ca](mailto:fletcher@mun.ca)>  
**Subject:** Fwd: FW: New course proposal OCSC 4940

Hello Garth,

The Biology Undergraduate Committee has reviewed the proposed change to OCSC 2500 as well as the new proposed course, OCSC 4940.

We have no concerns regarding the addition of a possible prerequisite for OCSC 2500.

Regarding OCSC 4940: we view this as a valuable addition to the OCSC course offerings. We note that you have included two Biology courses (BIOL 2250 and BIOL 2060) among your prerequisites. We suggest removing BIOL 2060 (a course that is often at full capacity) from the list since that course has BIOL 2250 as a prerequisite.

Thanks,  
Suzanne

On 23/03/2018 10:24 AM, Annie Mercier wrote:

Dear Suzanne:

Many thanks for your support and feedback. We have taken the time to discuss your suggestion concerning OCSC 4940 within the undergrad studies committee, with the prospective instructors, and we have also consulted with Shannon and Andy.

Based on all this, we have decided to stay flexible but emphasize a preference, using the following language:

"PR: Biology 2060 (or Biology 2250, or Biochemistry 2100, or both Biochemistry 2200 and 2091).  
Biology 2060 is preferred."

All the best,  
Annie

---

Annie Mercier, PhD  
Professor and Deputy Head,  
Department of Ocean Sciences  
Memorial University (Ocean Sciences Centre)  
St. John's, NL, Canada, A1C 5S7  
Tel: (709) 864-2011  
Email: [amercier@mun.ca](mailto:amercier@mun.ca)  
[www.mun.ca/osc/amercier/bio.php](http://www.mun.ca/osc/amercier/bio.php)

On 16/03/2018 3:14 PM, Fletcher, Garth wrote:

Thank you Suzanne for your suggestions regarding the removal of BIOL 2060 (Cell Biology). I suspect that the faculty member who will be teaching OCSC 4940 will want to have BIOL 2060 as a prerequisite. However I will leave the final decision to Annie and our undergraduate studies committee.

Regards

Garth



Newfoundland & Labrador, Canada  
Ocean Sciences Centre

April 4, 2018

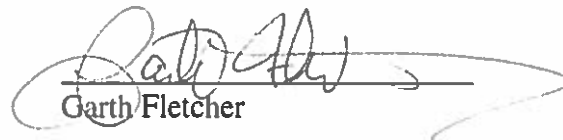
To: Dr. Mary Courage, Interim Dean  
Faculty of Science

From: Dr. Garth Fletcher, Head  
Department of Ocean Sciences

Re: Request for block of Special Topic Numbers

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The Department of Ocean Sciences is requesting approval of a block of numbers – OCSC 7500 to OCSC 7115 – for special topics courses. These numbers will be used for special topics courses in Marine Biology Program.



Garth Fletcher





Department of Mathematics and Statistics

St. John's, NL • Canada A1C 5S7

Tel: 709-864-8784 • Fax: 709-864-3010

April 4, 2018.

## Changes to the statistics programmes

The following documents outline the request for approval of some changes to the statistics graduate programmes. These changes can be summarised as follows:

1. Restructuring the Master of Applied Statistics programme consists of (i) introduction of three courses in applied statistics, (ii) replacing the mandatory courses with applied courses, (iii) replacing the practicum requirement with a project, and (iv) requirement of hands on consultancy experience. These changes will result in a course based programme of one year.
2. Approval of three new 3 credit hour courses: Stat-6509 *Statistical inference*, Stat-6519 *Regression models* and Stat-6559 *Statistical exploration of data*.
3. Approval of the 2 credit hour course Stat-698A/B *Applied statistics project*, which replaces Stat-6591 *Practicum*.
4. Regularisation of the 3 credit hour course Stat-6564 *Experimental designs*, course that is current offered as special topics.
5. Rename of Stat-6590 from *A course in statistical consulting* to *Statistical consultancy* and reduce the credits from 3 credit hour to 1 credit hour.
6. Rename of Stat-6545 from *Statistical computing* to *Computational statistics*.
7. Inclusion of the new course Stat-6559 and the regularised course Stat-6564 in the course offerings of the Masters of Science and Doctor of Philosophy programmes.
8. Change in the Master of Science in statistics programme consisting in replacing the requirement of “Stat-6510 and Stat-6560” by the requirement of “Stat-6510 and one of Stat-6500 or Stat-6560”, to provide an additional option for the core courses of the programme.

The documents enclosed are:

1. Request for approval of the restructuration of the Master of Applied Statistics Programme.
2. Strike-out changes to the calendar.
3. Request for approval forms of the courses Stat-6509, Stat 6519, Stat-6569, Stat-6590, Stat-698A/B.
4. Request for approval form of the course Stat-6564 that is currently offered as special topics course.



NEWFOUNDLAND &amp; LABRADOR, CANADA

Department of Mathematics and Statistics

St. John's, NL • Canada A1C 5S7

Tel: 709-864-8784 • Fax: 709-864-3010

April 4, 2018.

# Request for approval of the restructuring of the Master of Applied Statistics programme

## 1 Executive summary

With the recent advancements in *big data applications* and *data science*, there is a high demand for qualified professionals in the area of applied statistics. To meet this demand as well as to attract more students, we propose to re-structure the two year Master of Applied Statistics (MAS) programme by inducting more applied statistics courses, reducing the duration of the program to one year, replacing the practicum by an applied project and additional training in statistical consultancy. The re-structured program will train highly qualified professionals with strong computational skills who can effectively handle the data analysis in any area.

## 2 Rationale

The Department of Mathematics and Statistics offers two Masters level programmes in Statistics - Master of Science in Statistics and Master of Applied Statistics. Currently, the MAS programme has a duration of two years and it was developed to meet the demand for qualified professionals with practical knowledge in the application of statistics in different areas such as health science, industry, finance and other service organisations. However, in its current format, the programme does not attract many students due to the high level of theoretical based courses and long duration of the programme compared to the similar programmes across the country. To attract more students, we propose to re-structure the entire programme. The proposed re-structured degree programme will provide training in applied statistics and statistical consulting, as well as in the theory of statistics pertinent to applications, without compromising the quality of the programme.

## 3 Proposed changes

The current two year practicum based programme will be converted to one year programme comprising of six 3-credit-hour courses, one practical project and training in statistical consultancy.

### 3.1 Course Structure

Students need to successfully complete six 3-credit hour courses of which three are mandatory.

#### 3.1.1 Applied Statistics mandatory courses

- STAT 6509 Statistical Inference
- STAT 6519 Regression Models
- STAT 6545 Computational Statistics
- STAT 6590 Statistical Consultancy

- STAT 698A/B Applied Statistics Project

### **3.1.2 Applied Statistics elective courses**

- STAT 6505 Survival Analysis
- STAT 6530 Longitudinal Data Analysis
- STAT 6561 Categorical Data Analysis
- STAT 6559 Statistical Exploration of Data
- STAT 6562 Experimental Designs
- STAT 6563 Sampling Theory
- STAT 6571 Financial and Environmental Time Series
- STAT 6573 Statistical Genetics

To gain experience in the implementation of the techniques learned in the class, course projects should be included as part of the evaluation whenever possible.

## **4 Resources**

All the proposed courses can be offered by the current faculty members of the statistics group. No additional resources are required.

# I. CHANGES TO THE DEGREE OF MASTER OF APPLIED STATISTICS

## 7 Regulations Governing the Degree of Master of Applied Statistics

[ : ]

### 7.1 Qualifications for Admission

1. Admission is limited and competitive. To be considered for admission to the Master of Applied Statistics program, an applicant shall normally hold at least a high second class Honours Degree or its equivalent, ~~both in achievement and depth of study, in statistics or cognate discipline~~ from an institution recognized by the Senate.
2. In addition, an applicant shall normally have completed undergraduate courses in statistics which cover the material of Statistics 3521, 3530, 4410, 4520, 4560, 4561, 4590, ~~4591~~. If necessary, an applicant may be required to demonstrate a satisfactory knowledge of the above courses in an examination administered by the Department of Mathematics and Statistics.
3. ~~Applicants who do not meet these requirements should consult the Department of Mathematics and Statistics about a program of further undergraduate courses. Such a program is intended to provide the candidate with an adequate statistical background. Such courses may not be used to fulfill the program course requirements of the Master of Applied Statistics Degree.~~
- 3.4. Admission to the program shall be upon acceptance by the Dean of Graduate Studies after recommendation by the Head of the Department of Mathematics and Statistics along with a proposed program of study and a proposed Supervisor.

### 7.2 Program of Study

The minimum requirements for the Degree of Master of Applied Statistics are completion of the following:

1. ~~The three credit hours graduate courses STAT 6510 and STAT 6560 plus one from STAT 6530, STAT 6571 or STAT 6573~~ STAT 6509, STAT 6519 and STAT 6545, plus three additional 3 credit hour courses from the list of elective courses.
2. ~~Nine additional credit hours selected from STAT 6500-6589.~~ STAT 6590, which consists of a minimum of 20 hours of training in statistical consultancy to be arranged through the department's statistics consulting centre.
3. ~~The series STAT 697A/B or the completion of an additional 3 credit hour graduate course from STAT 6500-6589.~~
- 3.4. ~~STAT 6591~~ 698A/B and an a final applied statistics project with its associated report. The report must demonstrate a satisfactory general mastery of applied statistical knowledge.

### 7.3 Evaluation

1. In order to continue in graduate studies and in order to qualify for a Masters Degree, a candidate shall obtain an A or B for all regular program courses. In order to qualify for a graduation the student shall pass ~~STAT 697A/B and STAT 6591~~ STAT 6590 and STAT 689A/B, and complete successfully the ~~practicum~~ final project requirement.
2. ~~STAT 6591/698A/B will be evaluated by the student's consulting project advisor.~~ progress after each semester will be evaluated by the student's supervisor while the final applied statistics project report will be evaluated by a faculty member other than the supervisor appointed by the Department's Head.
3. ~~Evaluation of the practicum shall be carried out in accordance with Theses and Reports of the General Regulations governing all students in the School of Graduate Studies.~~

~~Note: Every candidate in graduate studies shall comply with the General Regulations, the Degree Regulations and any additional requirements of the Department of Mathematics and Statistics.~~

## 7.4 Courses

A selection of the following graduate courses will be offered to meet the requirements of candidates, as far as the resources of the Department will allow.

### **Applied Statistics mandatory courses**

STAT 6509 Statistical Inference

STAT 6519 Regression Models

STAT 6545 Computational Statistics

STAT 6590 Statistical Consultancy

STAT 698A/B Applied Statistics Project

### **Applied Statistics elective courses**

6500 Probability (credit restricted with former 6586)

6503 Stochastic Processes

6505 Survival Analysis

6510 Mathematical Statistics

6520 Linear Models

6530 Longitudinal Data Analysis

6540 Time Series Analysis

6545 Statistical Computing

6550 Nonparametric Statistics

6559 Statistical Exploration of Data

6560 Continuous Multivariate Analysis

6561 Categorical Data Analysis

6563 Sampling Theory

6564 Experimental Designs

6570-6589 Selected Topics in Statistics and Probability (excluding 6571, 6573, 6586)

6571 Financial and Environmental Time Series

6573 Statistical Genetics

6591 Practicum (1 credit hour)

697A/B Graduate Seminar Series in Statistics

## II. CHANGES TO THE DEGREE OF MASTER OF SCIENCE

[ : ]

### 24.18 Mathematics and Statistics

[ : ]

#### 24.18.1 Specific Requirements for the M.Sc. in Mathematics

Every ~~candidate for~~ student in the M.Sc. in Mathematics is required to complete one of two options:

1. Option 1: MATH 696A/B, two courses from MATH 6160, 6310, 6332, 6351, and a minimum of 9 further credit hours in courses chosen from the departmental course offerings, excluding MATH 6299, and a thesis as per General Regulations, Theses and Reports.
2. Option 2: MATH 6299, 696A/B, three courses from MATH 6160, 6310, 6332, 6351, and a minimum of 9 further credit hours in courses chosen from the departmental course offerings.

#### 24.18.2 Specific Requirements for the M.Sc. in Statistics

Every ~~candidate for~~ student in the M.Sc. in Statistics is required to complete a minimum of 18 credit hours in graduate courses including STAT 6510 and one of STAT 6500 or STAT 6560 ~~plus at least 12 credit hours in graduate courses~~ as well as the series STAT 697A/B or the completion of an additional 3 credit hour graduate course. A thesis is required as per General Regulations, Theses and Reports.

Students who already hold a Master of Applied Statistics are only required to complete STAT 6510 and one of STAT 6500 or STAT 6560 and a thesis as as per General Regulations, Theses and Reports.

[ : ]

#### 24.18.3 Courses

[ : ]

##### Statistics

6500 Probability (*credit restricted with former 6586*)  
 6503 Stochastic Processes  
 6505 Survival Analysis  
 6510 Mathematical Statistics  
 6520 Linear Models  
 6530 Longitudinal Data Analysis  
 6540 Time Series Analysis  
 6545 ~~Computational Statistics~~ Statistical Computing  
 6550 Nonparametric Statistics  
 6559 Statistical Exploration of Data  
 6560 Continuous Multivariate Analysis  
 6561 Categorical Data Analysis  
 6563 Sampling Theory

6564 Experimental Designs

6571 Financial and Environmental Time Series

6573 Statistical Genetics

6570-6589 Selected Topics in Statistics and Probability (excluding 6571, 6573, 6586)

697A/B Graduate Seminar Series in Statistics (2 credit hours)

The courses Stat-6509 and Stat-6519 cannot be used to satisfy the minimum 18 credit hour requirement of the M.Sc. programme in statistics.

### III. CHANGES TO THE DEGREE OF DOCTOR OF PHILOSOPHY

#### 33 Regulations Governing the Degree of Doctor of Philosophy

[ : ]

#### 33.26 Mathematics and Statistics

[ : ]

##### 0.1 33.26.4 Courses

[ : ]

##### Statistics

6500 ~~Probability (credit restricted with former 6586)~~

6503 Stochastic Processes

6505 Survival Analysis

6520 Linear Models

6530 Longitudinal Data Analysis

6540 Time Series Analysis

6545 Computational Statistics ~~Statistical Computing~~

6550 Nonparametric Statistics

6559 Statistical Exploration of Data

6561 Categorical Data Analysis

6563 Sampling Theory

6564 Experimental Designs

6571 Financial and Environmental Time Series

6573 Statistical Genetics

6570-6589 Selected Topics in Statistics and Probability (excluding 6571, 6573, 6586)

Notice that, although the courses 6160, 6310, 6332, 6351, 6500, 6510 and 6560 cannot be used to fulfill the 6 credit hours graduate courses requirement, any of them can be listed as part of the program of study as additional course work, whenever the supervisory committee deems it appropriate.





# Request for Approval of a Graduate Course

School of Graduate Studies

Adobe Reader, minimum version 8, is required to complete this form. Download the latest version: <http://get.adobe.com/reader>. (1) Save the form by clicking on the diskette icon on the upper left side of the screen; (2) Ensure that you are saving the file in PDF format; (3) Specify where you would like to save the file, e.g. Desktop; (4) Fill in the required data and save the file; (5) Submit the completed form to:

[School of Graduate Studies](#); Memorial University of Newfoundland; IIC-2012 (Bruneau Centre for Research and Innovation); St. John's, NL A1C 5S7 Canada Fax: 709.864.4702 eMail: [sgs@mun.ca](mailto:sgs@mun.ca)

To: Dean, School of Graduate Studies  
From: Faculty/School/Department/Program  
Subject:  Regular Course  Special/Selected Topics Course

Course No.: STAT 6509

Course Title: Statistical Inference

I. To be completed for all requests:

A. Course Type:  Lecture course  Lecture course with laboratory  
 Laboratory course  Undergraduate course<sup>1</sup>  
 Directed readings  Other (please specify)

B. Can this course be offered by existing faculty?  Yes  No

C. Will this course require new funding (including payment of instructor, labs, equipment, etc.)?  Yes  No  
If yes, please specify:

D. Will additional library resources be required (if yes, please contact [munul@mun.ca](mailto:munul@mun.ca) for a resource consultation)?  Yes  No

E. Credit hours for this course: 3

F. Course description (reading list required):  
See attachment

G. Method of evaluation:	Percentage	Oral
Class tests	Written 20	
Assignments	30	
Other (specify): Project	20	
Final examination:	30	

Total 100

<sup>1</sup> Must specify the additional work at the graduate level

**II. To be completed for special/selected topics course requests only**

**For special/selected topics courses, there is no evidence of:**

**Instructor's initials**

- 1. duplication of thesis work \_\_\_\_\_
- 2. double credit \_\_\_\_\_
- 3. work that is a faculty research product \_\_\_\_\_
- 4. overlap with existing courses \_\_\_\_\_

Recommended for offering in the      **Fall**      Winter      Spring      20\_\_

Length of session if less than a semester:

**III. This course proposal has been prepared in accordance with General Regulations governing the School of Graduate Studies**

  
 \_\_\_\_\_  
 Course instructor

**April 4, 2018**  
 \_\_\_\_\_  
 Date

  
 \_\_\_\_\_  
 Approval of the head of the academic unit

**April 4, 2018**  
 \_\_\_\_\_  
 Date

**IV. This course proposal was approved by the Faculty/School/Council**

\_\_\_\_\_  
 Secretary, Faculty/School/Council

\_\_\_\_\_  
 Date



Department of Mathematics and Statistics

St. John's, NL • Canada A1C 5S7

Tel: 709-864-8784 • Fax: 709-864-3010

April 4, 2018.

## Proposal for the graduate course

# Stat-6509 Statistical inference

## 1 Executive summary

This course is intended to be a requirement for the students in the Master of Applied Statistics (MAS) programme and replace Stat-6510 (Mathematical Statistics), which is a course covering some of the material presented here but with a highly theoretical orientation addressed to students in the research-based M.Sc. in statistics programme. This course will provide students in the MAS programme with the foundations of statistical inference.

## 2 Rationale

Any serious practitioner of statistics should have a good understanding of the principles of statistical inference. Such is the objective of this course, addressed to students in the MAS programme. As compared with Stat-6510, this course has the distinctive feature of adopting a practical approach through real life examples and exercises as the essential ingredients to present the material to the students.

## 3 Course

Stat-6509 Statistical inference.

## 4 Calendar description

Stat-6509. *Statistical inference* introduces the formal notion of parametric statistical model, the basis of data dimension reduction, and the essentials of parameter estimation and hypothesis testing.

## 5 Pre-requisites

A couple of basic courses in statistics, calculus, and familiarity with linear algebra and multiple integration.

## 6 Credit restriction

Stat-6509 is required for the MAS programme but cannot be used to satisfy the minimum course requirements of the M.Sc. in statistics programme.

## 7 Tentative course outline

1. Notions of probability and distribution theory.
2. Concepts of convergence and limiting distributions.
3. Sufficiency, completeness and ancillarity.
4. Point estimation.
5. Hypothesis testing.
6. Interval estimation.
7. Likelihood ratio test, Wald's test, and score test.
8. Large-sample inference and sample size determination.

## 8 Tentative evaluation scheme

Three assignments 30%, a midterm exam 20%, a project 20%, the final exam 30%.

## 9 Texts

1. *An introduction to probability and statistical inference, 2nd ed*, by GG Roussas. Academic Press, 2015. Chs. 4-12.
2. *Probability and statistical inference*<sup>1</sup> by N Mukhopadhyay. Marcel Dekker, Inc, 2000. Chs. 1, 5, 7, 9-15.
3. *Introduction to mathematical statistics, 7th ed*, by RV Hoog, JW McKean and AT Craig. Pearson, 2015. Chs. 4-8.
4. *Principles of statistical inference* by DR Cox. Cambridge University Press, 2006.
5. *Principles of applied statistics* by RD Cox and CA Donnelly. Cambridge University Press, 2011.
6. *Applied statistics, principles and examples* by DR Cox and EJ Snell, Chapman and Hall, 1981.
7. *A course in mathematical statistics, 2nd ed*, by GG Roussas. Academic Press, 1997. Chs. 5-8, 11-15.

## 10 Library holdings and/or other resources

There is already a significant number of books in statistical inference and mathematical statistics in the university library. No purchase of titles will be required.

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<sup>1</sup>Text used as reference for the proposed outline.



# Request for Approval of a Graduate Course

School of Graduate Studies

Adobe Reader, minimum version 8, is required to complete this form. Download the latest version: <http://get.adobe.com/reader>. (1) Save the form by clicking on the diskette icon on the upper left side of the screen; (2) Ensure that you are saving the file in PDF format; (3) Specify where you would like to save the file, e.g. Desktop; (4) Fill in the required data and save the file; (5) Submit the completed form to:

School of Graduate Studies; Memorial University of Newfoundland; IIC-2012 (Bruneau Centre for Research and Innovation); St. John's, NL A1C 5S7 Canada Fax: 709.864.4702 eMail: [sgs@mun.ca](mailto:sgs@mun.ca)

To: Dean, School of Graduate Studies  
From: Faculty/School/Department/Program  
Subject:  Regular Course  Special/Selected Topics Course

Course No.: STAT 6519

Course Title: Regression Models

I. To be completed for all requests:

A. Course Type:  Lecture course  Lecture course with laboratory  
 Laboratory course  Undergraduate course<sup>1</sup>  
 Directed readings  Other (please specify)

B. Can this course be offered by existing faculty?  Yes  No

C. Will this course require new funding (including payment of instructor, labs, equipment, etc.)?  Yes  No  
If yes, please specify:

D. Will additional library resources be required (if yes, please contact [munul@mun.ca](mailto:munul@mun.ca) for a resource consultation)?  Yes  No

E. Credit hours for this course: 3

F. Course description (reading list required):  
See attachment

G. Method of evaluation:	Written	Percentage	Oral
Class tests	20		
Assignments	30		
Other (specify): Project	20		
Final examination:	30		

Total 100

<sup>1</sup> Must specify the additional work at the graduate level

II. To be completed for special/selected topics course requests only

For special/selected topics courses, there is no evidence of:

Instructor's initials

- 1. duplication of thesis work \_\_\_\_\_
- 2. double credit \_\_\_\_\_
- 3. work that is a faculty research product \_\_\_\_\_
- 4. overlap with existing courses \_\_\_\_\_

Recommended for offering in the      Fall      Winter      Spring      20\_\_

Length of session if less than a semester:

III. This course proposal has been prepared in accordance with General Regulations governing the School of Graduate Studies



Course instructor

April 4, 2018

Date



Approval of the head of the academic unit

April 4, 2018

Date

IV. This course proposal was approved by the Faculty/School/Council

Secretary, Faculty/School/Council

Date



NEWFOUNDLAND &amp; LABRADOR, CANADA

Department of Mathematics and Statistics

St. John's, NL • Canada A1C 5S7

Tel: 709-864-8784 • Fax: 709-864-3010

April 4, 2018.

## Proposal for the graduate course

# Stat-6519 Regression Models

## 1 Executive summary

Linear statistical inference and its applications are fundamental to all areas of applied statistics. This new course will cover the basic regression models which are frequently used in linear statistical inferences. It will provide a powerful kit of tools to the Master of Applied Statistics students for the success in their future career.

## 2 Rationale

As noted in the summary, linear statistical inference is fundamental to all areas of applied statistics. Currently, our graduate students of Master of Applied Statistics are offered the course STAT 6521 (Linear models), which is very theoretical and hence more suitable for Doctorate and Master of Science students. Our Master of Applied Statistics students would be better served with the proposed new course, which develops the theory of linear statistical inference with a focus towards practical applications.

## 3 Course

Stat-6519 Regression models.

## 4 Calendar description

Stat-6519. *Regression models* will introduce simple and multiple linear regression, Gauss-Markov theorem and followed by residual analysis, tests of linear hypotheses, model building and regression diagnostics, analysis of variance and covariance and error-in-variable problems.

## 5 Credit restriction

Stat-6519 cannot be used to satisfy the minimum course requirements of the M.Sc. in statistics programme.

## 6 Tentative course outline

1. Simple and multiple linear regression, Gauss-Markov theorem.
2. Residual analysis.

3. Tests of linear hypotheses.
4. Model selection.
5. Regression diagnostics.
6. Analysis of variance.
7. Analysis of covariance.
8. Error-in-variable problems in regression models

## **7 Tentative evaluation scheme**

This will be structured as a lecture course with 30% for assignments, 20% projects, 20% for a midterm exam and 30% for the final exam.

## **8 Texts**

1. N. R. Draper, H. Smith. *Applied Regression Analysis*, John Wiley & Sons, Inc. New York, 1966.
2. C. R. Rao. *Linear Statistical Inference and Its Applications*, 2nd edition, John Wiley & Sons, Inc. New York, 2001.
3. D. A. Belsley, E. Kuh, R. E. Welsch. *Regression Diagnostics—Identifying influential data and sources of collinearity*, John Wiley & Sons, Inc. New York, 1980.
4. J. P. Buonaccorsi. *Measurement Error—Models, Methods and Applications*, Chapman & Hall/CRC, New York, 2010.

## **9 Library holdings and/or other resources**

There are already a significant number of books on multivariate analysis, data mining and machine learning in the university library. No purchase of text books will be required.





# Request for Approval of a Graduate Course

School of Graduate Studies

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School of Graduate Studies; Memorial University of Newfoundland; IIC-2012 (Bruneau Centre for Research and Innovation); St. John's, NL A1C 5S7 Canada Fax: 709.864.4702 eMail: [sgs@mun.ca](mailto:sgs@mun.ca)

To: Dean, School of Graduate Studies  
From: Faculty/School/Department/Program  
Subject:  Regular Course  Special/Selected Topics Course

Course No.: STAT 6559

Course Title: Statistical Exploration of Data

I. To be completed for all requests:

A. Course Type:  Lecture course  Lecture course with laboratory  
 Laboratory course  Undergraduate course<sup>1</sup>  
 Directed readings  Other (please specify)

B. Can this course be offered by existing faculty?  Yes  No

C. Will this course require new funding (including payment of instructor, labs, equipment, etc.)?  Yes  No  
If yes, please specify:

D. Will additional library resources be required (if yes, please contact [munul@mun.ca](mailto:munul@mun.ca) for a resource consultation)?  Yes  No

E. Credit hours for this course: 3

F. Course description (reading list required):  
See attachment

G. Method of evaluation:	Written	Percentage	Oral
Class tests			
Assignments	40		
Other (specify): Two projects	30		
Final examination:	30		
Total		100	

<sup>1</sup> Must specify the additional work at the graduate level

II. To be completed for special/selected topics course requests only

For special/selected topics courses, there is no evidence of:

Instructor's initials

- 1. duplication of thesis work \_\_\_\_\_
- 2. double credit \_\_\_\_\_
- 3. work that is a faculty research product \_\_\_\_\_
- 4. overlap with existing courses \_\_\_\_\_


Recommended for offering in the      Fall      Winter      Spring      20 \_\_\_\_

Length of session if less than a semester:

III. This course proposal has been prepared in accordance with General Regulations governing the School of Graduate Studies

  
\_\_\_\_\_  
Course instructor

April 4, 2018  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Approval of the head of the academic unit

April 4, 2018  
\_\_\_\_\_  
Date

IV. This course proposal was approved by the Faculty/School/Council

\_\_\_\_\_  
Secretary, Faculty/School/Council

\_\_\_\_\_  
Date



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Department of Mathematics and Statistics

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Tel: 709-864-8784 • Fax: 709-864-3010

April 4, 2018.

## Proposal for the graduate course

# Stat-6559 Statistical exploration of data

## 1 Executive summary

Because of recent advancement of statistical applications in different areas, there a high demand for qualified professionals in the area of statistical techniques for data analytics and big data analysis. The proposed course deals with a set of multivariate techniques that explore the data visualization and identification of patterns in the data. This course will equip the students with statistical and computational skills for turning big data sets into meaningful insights that may help to achieve a proper interpretation.

## 2 Rationale

With the availability of big data sets due to the improvement of technological developments, there is a high demand for personnel trained with statistical techniques aimed to explore the data in an efficient way. The profile of a statistics professional in this area includes the expertise in the visualisation of data to understand the patterns through appropriate statistical techniques. The proposed course is an attempt to bring together important new ideas in statistical learning and explain them in a statistical framework, with a sound mathematical foundation. The proposed course adopts a strong practical approach to the implementation of these techniques, emphasising the methods and its conceptual aspects rather than their theoretical features. A course of this kind is a part of the applied statistics programmes in most of the North American universities.

## 3 Course

Stat-6559 Statistical exploration of data.

## 4 Calendar description

Stat-6559. Statistical Exploration of Data will first introduce multivariate random variable and multivariate normal distribution followed by multivariate likelihood ratio tests. Supervised learning methods such as linear discriminant analysis, logistic regression, neural networks, recursive partitioning and nearest neighbours will be included. Unsupervised learning methods that will include are principal component analysis, cluster analysis. Other topics includes are methods for data visualization of large data sets using software R.

## 5 Tentative course outline

**Session I.** Multivariate random variable, Multivariate normal distribution, Likelihood ratio statistics, Hotelling  $T^2$  statistics.

**Session II.** Classification overview, Linear discriminant analysis, Logistic regression, Neural networks, Recursive partitioning, Nearest Neighbours, Support Vector Machines.

**Session III.** Unsupervised learning - Association Rules, Principal component analysis, Cluster analysis.

**Session IV.** Data visualization using R - plotting large data sets, Projection pursuit.

## **6 Tentative evaluation scheme**

Four assignments 40%, two projects 30% and final examination 30%.

## **7 Texts**

1. *The applied multivariate statistical analysis, 6th ed*, by RA Johnson and DW Wichern. Pearson, 2015.
2. *The elements of statistical learning* by T Hastie, R Tibshirani, and J Friedman. Springer, 2009.

## **8 Library holdings and/or other resources**

There is already a significant number of books on multivariate analysis, data mining and machine learning in the university library. No purchase of text books will be required.



# Request for Approval of a Graduate Course

School of Graduate Studies

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To: Dean, School of Graduate Studies  
From: Faculty/School/Department/Program  
Subject:  Regular Course  Special/Selected Topics Course

Course No.: Stat 6590

Course Title: Statistical Consultancy

I. To be completed for all requests:

A. Course Type:  Lecture course  Lecture course with laboratory  
 Laboratory course  Undergraduate course<sup>1</sup>  
 Directed readings  Other (please specify)

B. Can this course be offered by existing faculty?  Yes  No

C. Will this course require new funding (including payment of instructor, labs, equipment, etc.)?  Yes  No  
If yes, please specify:

D. Will additional library resources be required (if yes, please contact [munul@mun.ca](mailto:munul@mun.ca) for a resource consultation)?  Yes  No

E. Credit hours for this course: 1

F. Course description (reading list required):

MAS students must complete a minimum of 20 hours of training in statistical consultancy to be arranged through the department's Statistical Consulting Centre.

G. Method of evaluation: 

	Percentage	
	Written	Oral
Class tests		
Assignments		
Other (specify): Report	yes	
Final examination:		

Total Pass/Fail

<sup>1</sup> Must specify the additional work at the graduate level

**II. To be completed for special/selected topics course requests only**

**For special/selected topics courses, there is no evidence of:**

**Instructor's initials**

- 1. duplication of thesis work \_\_\_\_\_
- 2. double credit \_\_\_\_\_
- 3. work that is a faculty research product \_\_\_\_\_
- 4. overlap with existing courses \_\_\_\_\_


Recommended for offering in the                      Fall                      Winter                      Spring                      20 19

Length of session if less than a semester:

**III. This course proposal has been prepared in accordance with General Regulations governing the School of Graduate Studies**

  
\_\_\_\_\_  
Course instructor

**April 4, 2018**  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Approval of the head of the academic unit

**April 4, 2018**  
\_\_\_\_\_  
Date

**IV. This course proposal was approved by the Faculty/School/Council**

\_\_\_\_\_  
Secretary, Faculty/School/Council

\_\_\_\_\_  
Date



# Request for Approval of a Graduate Course

School of Graduate Studies

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To: Dean, School of Graduate Studies  
From: Faculty/School/Department/Program  
Subject:  Regular Course  Special/Selected Topics Course

Course No.: STAT 698A/B

Course Title: Applied Statistics Project

I. To be completed for all requests:

A. Course Type:  Lecture course  Lecture course with laboratory  
 Laboratory course  Undergraduate course<sup>1</sup>  
 Directed readings  Other (please specify) Practicum

B. Can this course be offered by existing faculty?  Yes  No

C. Will this course require new funding (including payment of instructor, labs, equipment, etc.)?  Yes  No  
If yes, please specify:

D. Will additional library resources be required (if yes, please contact [munul@mun.ca](mailto:munul@mun.ca) for a resource consultation)?  Yes  No

E. Credit hours for this course: 2

F. Course description (reading list required):

MAS students need to complete an application oriented project under the direction of their advisor. Students must register for this project the second, and third semesters of the programme and submit a final report to be evaluated by a faculty member other than the advisor.

G. Method of evaluation: 

	Percentage	
	Written	Oral
Class tests		
Assignments		
Other (specify): Project report	yes	
Final examination:		

Total Pass/Fail

<sup>1</sup> Must specify the additional work at the graduate level

II. To be completed for special/selected topics course requests only

For special/selected topics courses, there is no evidence of:

Instructor's initials

- 1. duplication of thesis work \_\_\_\_\_
- 2. double credit \_\_\_\_\_
- 3. work that is a faculty research product \_\_\_\_\_
- 4. overlap with existing courses \_\_\_\_\_

Recommended for offering in the                  Fall                  Winter                  Spring                  20 19

Length of session if less than a semester:

III. This course proposal has been prepared in accordance with General Regulations governing the School of Graduate Studies



\_\_\_\_\_  
Course instructor

April 4, 2018

\_\_\_\_\_  
Date



\_\_\_\_\_  
Approval of the head of the academic unit

April 4, 2018

\_\_\_\_\_  
Date

IV. This course proposal was approved by the Faculty/School/Council

\_\_\_\_\_  
Secretary, Faculty/School/Council

\_\_\_\_\_  
Date





# Request for Approval of a Graduate Course

School of Graduate Studies

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To: Dean, School of Graduate Studies  
From: Faculty/School/Department/Program  
Subject:  Regular Course  Special/Selected Topics Course

Course No.: STAT 6564

Course Title: Experiential Designs

I. To be completed for all requests:

A. Course Type:  Lecture course  Lecture course with laboratory  
 Laboratory course  Undergraduate course<sup>1</sup>  
 Directed readings  Other (please specify)

B. Can this course be offered by existing faculty?  Yes  No

C. Will this course require new funding (including payment of instructor, labs, equipment, etc.)?  Yes  No  
If yes, please specify:

D. Will additional library resources be required (if yes, please contact [munul@mun.ca](mailto:munul@mun.ca) for a resource consultation)?  Yes  No

E. Credit hours for this course: 3

F. Course description (reading list required):  
This course is already offered as special topics course.

G. Method of evaluation:	Percentage	
	Written	Oral
Class tests	20	
Assignments	30	
Other (specify): Project	20	
Final examination:	30	

Total 100

<sup>1</sup> Must specify the additional work at the graduate level

**II. To be completed for special/selected topics course requests only**

**For special/selected topics courses, there is no evidence of:**

**Instructor's initials**

- 1. duplication of thesis work \_\_\_\_\_
- 2. double credit \_\_\_\_\_
- 3. work that is a faculty research product \_\_\_\_\_
- 4. overlap with existing courses \_\_\_\_\_

Recommended for offering in the                      Fall                      Winter                      Spring                      20\_\_

Length of session if less than a semester:

**III. This course proposal has been prepared in accordance with General Regulations governing the School of Graduate Studies**

  
\_\_\_\_\_  
Course instructor

**April 4, 2018**  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Approval of the head of the academic unit

**April 4, 2018**  
\_\_\_\_\_  
Date

**IV. This course proposal was approved by the Faculty/School/Council**

\_\_\_\_\_  
Secretary, Faculty/School/Council

\_\_\_\_\_  
Date



NEWFOUNDLAND &amp; LABRADOR, CANADA

Department of Mathematics and Statistics

St. John's, NL • Canada A1C 5S7

Tel: 709-864-8784 • Fax: 709-864-3010

April 4, 2018.

## Proposal for the graduate course

# Stat-6564 Experimental designs

## 1 Executive summary

Experimental designs is a fundamental course in most Masters programmes in statistics. In the last few years, our department has offered this course as an special topics course. This document is a request to regularise this course and offer it as an elective for all of graduate programmes in statistics.

## 2 Rationale

Experiments are performed by researchers in all areas of scientific inquiry with the goal of gaining knowledge on the relationship between the experimental treatments and the responses of interest. Statistical experimental design and analysis is an indispensable tool for practitioners and researchers to obtain the best combination of factor levels used to compare and analyse the treatment responses while optimising the resources. In order to achieve the objective, the experimenter should decide on an appropriate design and carry out the proper analysis to make valid inferences. Modern methodologies include robust parameter designs, which is an innovative statistical approach to off-line and on-line quality and productivity improvement that attempts to improve a process or product by making it less sensitive to noise variables through statistically designed experiments. The proposed course focuses on the development of suitable design and analysis of experiments to optimise the process parameters to produce robust products. The proposed experimental design course is one of the compulsory courses for most Masters programmes in Statistics in all leading Canadian universities. Many students joining in our graduate program have very little knowledge on the experimental design. The proposed course will give more exposure the graduate students on experimental design and boost their career prospects.

## 3 Course

Stat-6564 Experimental Designs.

## 4 Calendar description

Stat-6562. *Experimental Designs* is one of the most fundamental tools in the statistical analysis toolbox that allow practitioners to obtain the best combination of factor levels used to compare and analyse the treatment responses while optimising the resources. This course is concern with the designs and statistical techniques necessary to make valid inferences in the context of experimental studies.

## 5 Tentative course outline

1. Basic principles of experimental designs

2. Review of one factor experiments
3. Full factorial experiments at two levels
4. Fractional factorial experiments at two levels
5. Split-plot designs
6. Factorial experiments with more than two levels
7. Response surface methodology
8. Optimal designs
9. Robust parametric designs
10. Robust parameter designs for signal–response systems
11. Experiments with non-normal data.

## **6 Tentative evaluation scheme**

Assignments 30%, projects 20%, midterm examination 20% and final examination 30%.

## **7 Texts**

1. DC Montgomery, *Design and analysis of experiments, 8th ed.* Wiley, 2012.
2. CFJ Wu, and MS Hamada, *Experiments – planning, analysis, and parameter design optimization, 2nd ed.* Wiley, 2009.
3. MS Phadke, *Quality engineering using robust design.* Prentice-Hall, 1989.
4. GEP Box, JS Hunter, and WG Hunter, *Statistics for experimenters – design, innovation and discovery, 2nd ed.* Wiley, 2005.

## **8 Library holdings and/or other resources**

There is already a significant number of books on experimental designs in the university library. No purchase of text books will be required.



Department of Psychology

March 19<sup>th</sup> 2018

Dr. JC Loredano-Osti  
Chair  
Graduate Studies Committee of Faculty of Science  
Faculty Council (FSFC)

**Re: Course Requirement Calendar changes - Psy.D. Program – Department of Psychology**

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Dear Dr. Loredano-Osti,

I've been asked by our Clinical Psychology Graduate (PsyD) Program to forward the following calendar change request. Incidentally, this proposed modification has received unanimous approval from our department.

Specifically, it is recommended that *Psychology 6001: Research Design* be removed from the PsyD program course requirements as it overlaps considerably with *Psychology 6602: Research Design in Clinical Psychology* (which is also currently offered). Further, most PhD programs in clinical psychology in Canada (and the CPA accreditation standards for doctoral programs in clinical psychology) require only 1 research design course at the doctoral level. This modification is also practical as the PsyD program is very course-heavy and is an effective way to consolidate course requirements.

A Word document illustrating the change has been forwarded to the Office of the Dean of Science.

Please contact me if you have any questions or concerns.

Sincerest regards,

A handwritten signature in blue ink, consisting of a stylized, cursive 'K' followed by a horizontal line.

---

Ken Fowler, Ph.D.  
Graduate Officer/Professor  
Department of Psychology  
Memorial University of Newfoundland  
Telephone: 1(709) 864-7672  
kenfowler@mun.ca

### 34.3 Program of Study

Students are required to successfully complete at least ~~63~~ 60 credit hours in regulation graduate courses. These include:

- a. ~~9~~ 6 credit hours in statistics and research design courses (6000, ~~6001~~, 6602);
- b. 27 credit hours in core courses (6611, 6612, 6620, 6623, 6630, 6631, 6632, 6633, 6650, 6670); and
- c. 27 credit hours in practicum courses (7010, 7020, 7021, 7030, 7031, 7032, 7033, 7034, 7035).

Students must also complete a year-long internship, pass a comprehensive exam and successfully complete a research thesis.



**Dean of Science Office**

St. John's, NL Canada A1B 3X7  
Tel: 709 864 8153 Fax: 709 864 3316  
deansci@mun.ca www.mun.ca/science

March 22, 2018

**TO:** Registrar's Office  
**FROM:** Secretary, Faculty of Science Faculty Council  
**SUBJECT:** Special Topics Courses

---

The special topics course, PSYC 6118, Substance Use and Behavioural Addictions in Youth, has been approved by the Faculty of Science Faculty Council Graduate Studies Committee.

The Request for Approval of a Graduate Course forms are attached. If you require more information please let me know.

A handwritten signature in black ink that reads "Gina Jackson". The signature is written in a cursive style and is positioned above a horizontal line.

Gina Jackson  
Secretary, Faculty of Science Faculty Council

/gbk

cc: A. Williams, School of Graduate Studies  
L. Martin, Psychology

Dean of Science


 MEMORIAL  
UNIVERSITY

MAR 16 2018

Received

## Request for Approval of a Graduate Course

School of Graduate Studies

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To: Dean, School of Graduate Studies  
 From: Faculty/School/Department/Program  
 Subject:  Regular Course  Special/Selected Topics Course

Course No.: **PSY6118**Course Title: **Substance Use and Behavioural Addictions in Youth**

## I. To be completed for all requests:

A. Course Type:  Lecture course  Lecture course with laboratory  
 Laboratory course  Undergraduate course<sup>1</sup>  
 Directed readings  Other (please specify)

B. Can this course be offered by existing faculty?  Yes  No

C. Will this course require new funding (including payment of instructor, labs, equipment, etc.)?  Yes  No  
 If yes, please specify:

D. Will additional library resources be required (If yes, please contact [munul@mun.ca](mailto:munul@mun.ca) for a resource consultation)?  Yes  No

E. Credit hours for this course: **Three credit hours**

F. Course description (reading list required):  
 This course will explore several areas pertaining to substance use and behavioural addictions in youth. Specifically, developmental pathways to youth addiction will be reviewed, along with evidence-based prevention and treatment approaches targeting youth addiction. The proposed course textbook will be "Internet Addiction in Children and Adolescents" (Young et al., 2017). Additional assigned reading will be included accordingly.

G. Method of evaluation:

	Percentage	
	Written	Oral
Class tests		
Assignments	2	
Other (specify):		
Final examination:		

Total 2 papers at 50 percent each

<sup>1</sup> Must specify the additional work at the graduate level



II. To be completed for special/selected topics course requests only

For special/selected topics courses, there is no evidence of:

Instructor's initials

- 1. duplication of thesis work NH
- 2. double credit NH
- 3. work that is a faculty research product NH
- 4. overlap with existing courses NH

Recommended for offering in the                      Fall                      Winter                      Spring                      20 18

Length of session if less than a semester:

III. This course proposal has been prepared in accordance with General Regulations governing the School of Graduate Studies

[Signature]  
Course instructor

March 12<sup>th</sup> / 2018  
Date

[Signature]  
Approval of the head of the academic unit

March 12<sup>th</sup> / 2018  
Date

IV. This course proposal was approved by the Faculty/School/Council

[Signature]  
Secretary, Faculty/School/Council

March 22/18  
Date

## **Tentative Course Reading List:**

### **Textbook:**

Young, K. S. (Ed.). (2017). *Internet Addiction in Children and Adolescents: Risk Factors, Assessment, and Treatment*. Springer Publishing Company.

### **Research Reports:**

Canadian Centre on Substance Abuse (2017). Canadian Youth Perceptions of Cannabis. Retrieved from [www.ccsa.ca](http://www.ccsa.ca)

Canadian Centre on Substance Abuse (2015). The Effects of Cannabis Use During Adolescence. Retrieved from [www.ccsa.ca](http://www.ccsa.ca)

Canadian Centre on Substance Abuse (2014). Childhood and Adolescent Pathways to Substance Use Disorders. Retrieved from [www.ccsa.ca](http://www.ccsa.ca)

Canadian Centre on Substance Abuse (2011). Cross-Canada report on Student Alcohol and Drug use. Retrieved from [www.ccsa.ca](http://www.ccsa.ca)

### **Peer-Reviewed Articles:**

Anderson, E. L., Steen, E., & Stavropoulos, V. (2017). Internet use and Problematic Internet Use: A systematic review of longitudinal research trends in adolescence and emergent adulthood. *International Journal of Adolescence and Youth, 22*(4), 430-454.

Calado, F., Alexandre, J., & Griffiths, M. D. (2017). Prevalence of adolescent problem gambling: A systematic review of recent research. *Journal of Gambling Studies, 33*(2), 397-424.

Jernigan, D., Noel, J., Landon, J., Thornton, N., & Lobstein, T. (2017). Alcohol marketing and youth alcohol consumption: a systematic review of longitudinal studies published since 2008. *Addiction, 112*(S1), 7-20.

Li, L., Zhu, S., Tse, N., Tse, S., & Wong, P. (2016). Effectiveness of motivational interviewing to reduce illicit drug use in adolescents: A systematic review and meta-analysis. *Addiction, 111*(5), 795-805.

Meier, M. H., Hill, M. L., Small, P. J., & Luthar, S. S. (2015). Associations of adolescent cannabis use with academic performance and mental health: a longitudinal study of upper middle class youth. *Drug & Alcohol Dependence, 156*, 207-212.

Ttofi, M. M., Farrington, D. P., Lösel, F., Crago, R. V., & Theodorakis, N. (2016). School bullying and drug use later in life: A meta-analytic investigation. *School psychology quarterly, 31*(1), 8.