

Faculty of Science

Office of the Dean St. John's, NL Canada A1B 3X7 Tel: 709 864 8154 Fax: 709 864 3316 deansci@mun.ca www.mun.ca/science

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, December 6, 2022, at 1:00 p.m. by WebEx and in-person (Room: C- 2045).

AGENDA

- 1. Regrets
- 2. Adoption of the Minutes of November 16, 2022
- 3. Business Arising from the Minutes
- 4. Correspondence: None
- 5. Reports of Standing Committees:
 - A. Undergraduate Studies Committee:
 - Presented by Shannon Sullivan, Chair, Undergraduate Studies Committee
 - a. Department of Biology Calendar Changes, New Course Biology 4720, Paper 5.A.a. (pages 6-12)
 - b. Department of Biology Calendar Changes, Amend Course Biology 4306, Paper 5.A.b. (pages 13-18)
 - c. Department of Biology Calendar Changes, Amend Courses- Biology 3750 and 4701, Paper 5.A.c. (pages 19- 22)
 - d. Department of Biology Calendar Changes, Amend Courses Biology 3710, 3711, 3714, and 3715, Paper 5.A.d. (pages 23-29)
 - e. Department of Biology Calendar Changes Amend Courses Biology 4650/ GEOG 4650, Paper 5.A.e. (pages 30-33)
 - f. Department of Biology Calendar Changes, Amend Courses Biology 4651, Paper 5.A.f. (pages 34-37)
 - g. Department of Biology Calendar Changes, Amend Course Biology 3710, Paper 5.A.g. (pages 38-46)
 - h. Department of Biology Calendar Changes, Amend Program Regulations Major and Honours in Biology and Joint Majors Marine Biology, Paper 5.A.h. (pages 47-51)
 - i. Department of Mathematics and Statistics Calendar Changes, New Course Statistics 1500, Paper 5.A.i. (pages 52-62)
 - j. Department of Mathematics and Statistics Calendar Changes, New Course Statistics 4504, Paper 5.A.j. (pages 63-73)
 - k. Department of Mathematics and Statistics Calendar Changes, Amend Course- Mathematics 2260, Paper 5.A.k. (pages 74-86)

- Department of Psychology Calendar Changes, Amend Programs 11.11.2, 11.11.4, and 11.11.6, Paper 5.A.l. (pages 87-99)
- m. Department of Psychology Calendar Changes, Amend Programs, 10.2.10, Paper 5.A.m. (pages 100-107)
- n. Department of Psychology Calendar Changes, Amend Course Psychology 4910, Paper 5.A.n. (pages 108-115)
- Department of Psychology Calendar Changes, Amend Course Psychology 3810, Paper 5.A.o. (pages 116-122)
- p. Department of Computer Science Calendar Changes, New Course Computer Science 3730, Paper 5.A.p. (pages 123-127)
- q. Department of Earth Sciences Calendar Changes, Amend Courses Earth Sciences 4171, 4173, 4179, Paper 5.A.q. (pages 128-131)
- r. Department of Earth Sciences New Course Earth Sciences 2100, Paper Paper 5.A.r. (pages 132-151)
- s. Department of Physics Calendar Changes, Amend Course Physics 2750, Paper 5.A.s. (pages 152-157)
- t. Department of Chemistry Calendar Changes, New Course Chemistry 4432, Paper 5.A.t. (pages 158-162)
- u. Department of Ocean Sciences Calendar Changes, Amended programs (s): Majors/Honours in Ocean Sciences and Joint Major/Honours in Marine Biology Paper 5.A.u. (pages 163-174)
- v. Department of Ocean Sciences Calendar Changes, Amend Course Ocean Sciences 3600, Paper 5.A.v. (pages 175-180)
- w. Department of Ocean Sciences Calendar Changes, Amend Course Ocean Sciences 2000, Paper 5.A.w. (pages 181-186)
- x. Department of Ocean Sciences Calendar Changes, Amend Courses Ocean Sciences 4910, 4920, 4921, 4940, Paper 5.A.x. (pages 187-196)
- y. Department of Biochemistry Calendar Changes, New Program BSc in Human Biosciences, Paper 5.A.y. (pages 197-349)
- B. Graduate Studies Committee: No business
- C. Library Committee: No business
- 6. Reports of Delegates from Other Councils: None
- 7. Report of the Dean
- 8. Question Period
- 9. Adjournment

Travis Fridgen, Ph.D. Acting Dean of Science



Faculty of Science

Office of the Dean St. John's, NL Canada A1B 3X7 Tel: 709 864 8154 Fax: 709 864 3316 deansci@mun.ca www.mun.ca/science

FACULTY OF SCIENCE FACULTY COUNCIL OF SCIENCE Minutes of Meeting of October 19, 2022

A meeting of the Faculty Council of the Faculty of Science was held on Wednesday, November 16, 2022, at 1:00 p.m. using a hybrid model of Webex and in-person (C-2045).

FSC 2982 Present

Business Administration A. Stapleton

Biochemistry M. Berry, V. Booth, S. Christian

Biology

D. Bignell, A. Chaulk, S. Dawe, E. Edinger, L. Pena-Castillo, B. Staveley K. Tahlan, Y. Wiersma

Chemistry

C. Bottaro, L. Cahill, k. Jobst, M. Katz, F. Kerton, C. Kozak, S. Pansare, B. Power, S. Smith, J. Stockmann, H. Therien-Aubin

Computer Science

C. Dohey, A. Fiech, M. Hatcher, O. Meruvia-Pastor, T. Tricco

Earth Sciences H. Corlett, G. Dunning, A. Langille, A. Leitch, M. Miskell, P. Morrill

Mathematics & Statistics

J. Alam, I. Booth, D. Dyer, C. Evans, D. Harvey, A. Hatefi, R. Haynes, J.C. Loredo-Osti, S. MacLachlan, , M. Strong, T. Stuckless, K. Welford, Y. Yilmaz-Cigsar

Ocean Sciences I. Fleming, P. Gagnon, E. Ignatz, D. Nichols, M. Rise

Physics & Physical Oceanography D. Coombs, M. Geng, E. Hayden, H. Neilson, I. Siaka-Voivod, L. Zedel,

Psychology

A. Brown, D. Hallett, C. Hyde, G. Sherren, A. Swift-Gallant, C. Thorpe, C. Walsh

Registrar's Office

T. Edmunds

Dean of Science Office

J. Blundell, J. Bowering, C. Hussey, S. Dufour, K. Foss, J. Major, T. Fridgen, G. Jackson, J. Kavanagh, R. Newhook, T. Mackenzie, K. White

Student Representatives:

E. Dormody, W. Kinden, G. Sherren

- FSC 2983 Regrets: K. Poduska, S. Sullivan,
- FSC 2984 Adoption of Minutes Moved: Minutes of the meeting of October 19, 2022, be adopted. (Berry/Katz) Carried.
- **FSC 2985 Business Arising:** The President and Vice President will be attending a Special Faculty Council held on December 5 at 1:15pm.
- FSC 2986 Correspondence: None

FSC 2987 Reports of Standing Committees:

A. Undergraduate Studies Committee:

- Presented by Mark Hatcher, Deputy Chair, Undergraduate Studies Committee
- a. Department of Biology Calendar Changes, Amend Course Biology 3050, (Hatcher/Chaulk) **Carried.**
- b. Department of Biology Calendar Changes, Amend Program Regulations – Biology Concentrations, (Hatcher /Chaulk) **Carried.**
- c. Department of Biology Calendar Changes, Amend Course Descriptions, (Hatcher /Chaulk) **Carried.**
- d. Department of Biology Calendar Changes, Amend Course Biology 4245, (Hatcher /Chaulk) **Carried.**
- e. Department of Mathematics and Statistics Calendar Changes, Amend Course – Math 1001, (Hatcher /Loredo-Osti) **Carried.**
- f. Department of Mathematics and Statistics Calendar Changes, Amend Course Prerequisites – Math 4133, (Hatcher /Loredo-Osti) **Carried.**
- g. Department of Mathematics and Statistics Calendar Changes, Amend Course Prerequisites – Math 4180, (Hatcher /Loredo-Osti) **Carried.**
- B. Graduate Studies Committee: Presented by Dawn Bignell, Chair, Graduate Studies Committee

- a. Department of Biology Calendar Change Comprehensive Examinations, (Bignell/Chaulk) **Carried.**
- b. Department of Psychology Calendar Change Removing GRE as application requirement for Psy.D Program, (Bignell/Bottaro) **Carried.**
- C. Library Committee: No business.

FSC 2988 Reports of Delegates from Other Councils: None

FSC 2989 Report of the Dean:

Presented by Suzanne Dufour, Associate Dean of Undergraduate and Administration on behalf of Jacqueline Blundell, Associate Dean of Graduate and Research:

On the Menu will take place on Thursday, November 17 from 1:00-2:00 pm. Research week begins November 21. The Faculty of Science will be hosting 3MT (Three Minute Thesis) for graduate students on November 21 at 11:30am. Whale of a Time Take 2 will be held on November 24 from 5:00 - 7:00 pm in the Whale Atrium in the Core Science Building. Please RSVP your attendance to science@mun.ca.

FSC 2990 Question Period

There will be a delay for a new replacement of ROMEO. If this is a concern to you, please reach out.

MUNFA negotiations are ongoing. The Union is in discussions with MUNFA members and negotiations will continue on November 30 and December 1, 2022.

Some Faculty Members indicated that they are opposed to the recent decision to cancel some of the faculty position searches, and asked whether searches could instead be postponed.

The Dean clarified that there are between eight to ten faculty positions cancelled. The departments going ahead with faculty hires are Computer Science, Psychology and Ocean Science. The Faculty of Science needs to put resources to the places that benefits its students. The underlying reason for the loss faculty positions is due to the budget reduction that we have been allocated. A document was sent to the heads explaining how to request faculty positions. In previous years, when a faculty member retired, the positions were usually replaced with a position in that department. Now, with retirements and loss of positions, the Faculty of Science have to look at where the positions are best utilized for the entire Faculty.

The Dean will reach out to the Provost Office regarding an update EDI-AE Consultation Sessions.

FSC 2991 Adjournment

Meeting adjourned at 1:45 pm.

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- X New course(s): BIOL 4720 Corals and Coral Reefs
- \Box Amended or deleted course(s):
- □ New program(s):
- \Box Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council: _____

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

COURSE NUMBER AND TITLE

BIOL 4720: Corals and Coral Reefs

REVISED COURSE NUMBER AND TITLE

ABBREVIATED COURSE TITLE

Corals and Coral Reefs

RATIONALE

Corals and coral reefs are important marine ecosystems which are covered briefly in a number of courses (BIOL 2600, BIOL 3710, BIOL 3711, BIOL 3712), but which attract enough interest to merit a course on their own. This course will contribute to the major in Marine Biology offered through the departments of Biology and Ocean Sciences. The course could also be cross-listed with the Geography department.

CALENDAR CHANGES

4712 Coral and Coral Reefs

Is an advanced course in science and management of corals and coral reefs, including cold-water corals. Topics include basic coral biology, coral reef geomorphology, optical and acoustic remote sensing of corals and reefs, reef fish and fisheries, reefs and climate change, pollution effects on corals and coral reefs, reef conservation, social, cultural and economic aspects of reef management.

PR: two of BIOL 2600, 3650, 3709, 3710, 3711, or 3714, or permission of instructor. CR: Geography 4917

CALENDAR ENTRY AFTER CHANGES

SECONDARY CALENDAR CHANGES

A version of this course was offered once as a Geography special topics course, Geog 4917, but a formal calendar entry was never completed. There should be not be a need for secondary changes to the calendar.

Sample Course Outline and Method of Evaluation

Course Outline and Method of Evaluation

Course Objectives. The course will concentrate on the Science and Management of coral reefs. Reef science aspects to be considered include basic biology of corals, biology of the coral-symbiont microbiome, coral reef biogeography, coral reef geomorphology, optical and acoustic remote sensing of coral reefs, oceanography surrounding coral reefs, corals and reefs through geological time, especially the Quaternary sea level changes, diversity and biogeography of cold-water corals, climate change impacts on corals and coral reefs, pollution on coral reefs and reef fisheries. Management aspects to be considered include reef fisheries management, reef conservation, marine protected areas on reefs, human dependence on coral reefs, and international initiatives for reef conservation.

Lecture periods will consist of one 3-hour class meeting per week. Some of these class meetings will dedicated to working with physical samples, remote sensing data, or video analysis, while others will consist of more traditional lectures and seminar format.

Requirements: The course will consist of 5 components -- lectures, mini-laboratory assignments, discussion of key papers in coral reef science and management, regional reef summary posters, and individual project/seminars. Paper discussions will involve analysis of coral / reef papers in class. Students will be required to read approximately 1.5 papers per week, and will be expected to summarize the principal conclusions of three articles in 1 page written synopses, and lead discussion of those papers for the class.

Evaluation:	
Mini-Lab assignments:	25%
Paper summaries:	15%
Regional reef assessment poster:	15%
Individual Project:	20%
Final Exam:	25%

Mini- lab assignments (25%)

Five of the class meetings will include mini-lab assignments, collectively worth 25% of the term marks. Mini-labs are short enough that any specimen or data analysis can be finished within part of a 3-hour period, requiring only a short mini-lab report as homework.

Paper summaries (15%)

Students will be required to read 1-2 papers per week, in lieu of textbook readings. Students will be required to submit a $\frac{1}{2}$ -page summary of each paper and will be expected to lead a discussion of three of those papers.

Regional Reef Summary poster (15%)

Compile and present to the class a poster describing the corals and coral reefs of a country or region of the world (e.g. French Polynesia, Great Barrier Reef region, Indonesia, NW Australia, Micronesia, Papua New Guinea, Vanuatu). Use Spalding, World Atlas of Coral Reefs, and International Coral Reef Initiative (ICRI) regional summaries as starting references.

Individual Project (25%)

Research and present to the class a summary of a reef science and management issue of your choice. Sample topics could include: coral bleaching, eutrophication on coral reefs, overfishing on coral reefs, cold-water coral fish assemblages, fishing impacts on cold-water corals, marine protected areas in coral reef environments, community-based coral reef management, volunteer-based reef monitoring (e.g. Reef-Check). Your project should address both science and management. Format your paper according to *Coral Reefs* instructions to authors. Paper due at time of presentations. Seminar: 10%, Paper, 15%.

Final Exam: 25%

Week	Торіс
1	Coral & Reef distributions & controlling factors
2	Basic biology of tropical corals & cold-water corals, Mini-lab on coral
	identification and description.
3	Tropical reef geomorphology & biodiversity
4	Coral reef response to sea level change. Mini-lab: modelling reef
	response to sea level.
5	Remote sensing of coral reefs. Mini-lab on remote sensing & video
	analysis.
6	Cold-water corals & their habitats
7	Reef fish and trophic ecology. Mini-lab: coral reef fisheries.
8	Cold-water coral fishes & fisheries impacts
9	Pollution effects on reefs
10	Corals, reefs, climate change, and ocean acidification. Mini-lab on
	coral bleaching and coral reef carbonate budgets.
11	Reef conservation and marine protected areas
12	Human dimensions of reef management
13	The future of corals and coral reefs

Tentative Lecture Schedule

Texts

There is no single required textbook. Students will be assigned chapters in textbooks held on reserve, and given a reading list of papers from journals held by the library. Students will be expected to read 1-3 papers per week as assigned readings, in addition to readings for their posters and term projects.

Instructor(s)

E. Edinger (Geog/Biol)

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

CONSULTATIONS SOUGHT

From

Response Received

Grenfell campus Faculty of Business Administration Faculty of Education Faculty of Engineering & Applied Science Faculty of Humanities & Social Sciences Faculty of Science Department of Biochemistry Department of Chemistry **Department of Computer Sciences Department of Earth Sciences** Department of Economics Department of Geography **Department of Mathematics and Statistics Department of Ocean Sciences** Department of Physics and Physical Oceanography Department of Psychology Marine Institute School of Human Kinetics and Recreation School of Medicine School of Nursing School of Pharmacy School of Social Work

Yes - supportive

Soliciting email:

From: deansciassistant

Sent: Friday, November 4, 2022 11:42 AM To: BiocDHundergrad; Biology Academic Program Officer; Charles Mather; CS General; Department of Chemistry Consult; Hunt, Donna M.; Gagnon, Patrick; Goulding, Rick; Hyde, Cathy; Ivan Saika-Voivod; Joseph Jacob; Kavanagh, Julie; Power, Keith B; Mackenzie, Theresa; mathconsult@mun.ca; mhatcher@mun.ca; Morrill, Penny L; Newhook, Rebecca; psychdeputyhead@mun.ca; Associate Dean of Science (Undergraduate); Wiersma, Yolanda Subject: FW: Biology documents for consultation

From: Wiersma, Yolanda <ywiersma@mun.ca> Sent: Friday, November 4, 2022 11:35 AM To: deansciassistant <deansciassistant@mun.ca> Subject: Biology documents for consultation

Hi Cherie,

Please send the attached documents from the Biology Undergraduate Committee out for consultation. Feedback can be sent to me (ywiersma@mun.ca). Please send feedback by Monday November 21.

Thanks,

Yolanda

Dr. Yolanda F. Wiersma, PhD (she/her) Professor and Deputy Head (Undergraduate)

I support my union's efforts to achieve a fair deal. We are MUNFA!

Department of Biology Memorial University of Newfoundland and Labrador St. John's, NL, Canada

Ph. 709.864.7499 Cell. 709.986.8543

https://nllandscapeecology.com/

Response received:

From: BiocDHundergrad <<u>biocdhundergrad@mun.ca</u>> Sent: Sunday, November 6, 2022 5:09 PM To: Wiersma, Yolanda <<u>ywiersma@mun.ca</u>> Cc: Booth, Valerie <<u>vbooth@mun.ca</u>> Subject: Fw: Biology documents for consultation

Hi Yolanda,

On behalf of Biochemistry, I have reviewed the seven calendar change proposals sent out for consultation by Biology. I see no impact on our program or courses, so I have no concerns.

Cheers, Janet

Janet Brunton, PhD Professor and Deputy Head (Undergraduate) Department of Biochemistry Memorial University of Newfoundland

phone 709 864-8533 fax: 709 864-2422

LIBRARY REPORT

Email requesting library report has been initiated (29 Sept. 2022). No response has

been received as of 1 December 2022.

RESOURCE IMPLICATIONS

Because this course is lecture-only, there are no additional resources other than instructor time. Dr. Evan Edinger (Joint appointment in Biology and Geography) is well-qualified to teach this course and it is assumed this would become part of his normal load.

ADDITIONAL INFORMATION REQUIRED FOR NEW COURSE PROPOSALS

Sample syllabus including information on evaluation, textbook, topics is appended above.

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- \Box New course(s):
- **X** Amended or deleted course(s):
 - BIOL 4306 Applied Biology
- □ New program(s):
- \Box Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council: _____

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

COURSE NUMBER AND TITLE

BIOL 4306 - Applied Biology

REVISED COURSE NUMBER AND TITLE

BIOL 4306 - Applied Ecology

ABBREVIATED COURSE TITLE

Applied Ecology

RATIONALE

This course is co-offered with ENVS 6003 – Applied Ecology. The proposed modifications will align our undergraduate course with the linked graduate version and, along with the modified course description, provides a more accurate representation of the material covered in the course.

CALENDAR CHANGES

12.2 Biology

4306 Applied Biology Ecology

is an examination of how biological and other sciences are applied to the problems of management and utilization of organisms at both the individual and systems level to meet human needs. uses ecological theory in a problem-solving approach to a diversity of topics including: ecological surveying and monitoring, ecological indicators, ecological impact assessment, remediation ecology, landscape management, management of invasive species, pest management, sustainable agriculture, captive breeding and zoo animal husbandry in the context of reintroduction and rewilding. CR: the former BIOL 4303 or the former BIOL 4304

PR: BIOL 2060, 2250, 2600, 2900 and one of BIOL 2010, 2122 or 2210

CALENDAR ENTRY AFTER CHANGES

12.2 Biology

4306 Applied Ecology

uses ecological theory in a problem-solving approach to a diversity of topics including: ecological surveying and monitoring, ecological indicators, ecological impact assessment, remediation ecology, landscape management, management of invasive species, pest

Paper 5.A.b. (pages13-18)

management, sustainable agriculture, captive breeding and zoo animal husbandry in the context of reintroduction and rewilding.

PR: BIOL 2600

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

From

Response Received

Grenfell campus Faculty of Business Administration Faculty of Education Faculty of Engineering & Applied Science Faculty of Humanities & Social Sciences Faculty of Science Department of Biochemistry Department of Chemistry **Department of Computer Sciences Department of Earth Sciences** Department of Economics Department of Geography **Department of Mathematics and Statistics Department of Ocean Sciences** Department of Physics and Physical Oceanography Department of Psychology Marine Institute School of Human Kinetics and Recreation School of Medicine School of Nursing School of Pharmacy School of Social Work

Yes - supportive

Soliciting email:

From: deansciassistant

Sent: Friday, November 4, 2022 11:42 AM

To: BiocDHundergrad; Biology Academic Program Officer; Charles Mather; CS General; Department of Chemistry Consult; Hunt, Donna M.; Gagnon, Patrick; Goulding, Rick; Hyde, Cathy; Ivan Saika-Voivod; Joseph Jacob; Kavanagh, Julie; Power, Keith B; Mackenzie, Theresa; mathconsult@mun.ca; mhatcher@mun.ca; Morrill, Penny L; Newhook, Rebecca; psychdeputyhead@mun.ca; Associate Dean of Science (Undergraduate); Wiersma, Yolanda Subject: FW: Biology documents for consultation From: Wiersma, Yolanda <ywiersma@mun.ca> Sent: Friday, November 4, 2022 11:35 AM To: deansciassistant <deansciassistant@mun.ca> Subject: Biology documents for consultation

Hi Cherie,

Please send the attached documents from the Biology Undergraduate Committee out for consultation. Feedback can be sent to me (ywiersma@mun.ca). Please send feedback by Monday November 21.

Thanks,

Yolanda

Dr. Yolanda F. Wiersma, PhD (she/her) Professor and Deputy Head (Undergraduate)

I support my union's efforts to achieve a fair deal. We are MUNFA!

Department of Biology Memorial University of Newfoundland and Labrador St. John's, NL, Canada

Ph. 709.864.7499 Cell. 709.986.8543

https://nllandscapeecology.com/

Response received:

From: BiocDHundergrad <<u>biocdhundergrad@mun.ca</u>
Sent: Sunday, November 6, 2022 5:09 PM
To: Wiersma, Yolanda <<u>ywiersma@mun.ca</u>
Cc: Booth, Valerie <<u>vbooth@mun.ca</u>
Subject: Fw: Biology documents for consultation

Hi Yolanda,

On behalf of Biochemistry, I have reviewed the seven calendar change proposals sent out for consultation by Biology. I see no impact on our program or courses, so I have no concerns.

Cheers,

Janet

Janet Brunton, PhD Professor and Deputy Head (Undergraduate) Department of Biochemistry Memorial University of Newfoundland

phone 709 864-8533 fax: 709 864-2422

LIBRARY REPORT

Not applicable.

RESOURCE IMPLICATIONS

No change is expected with regards to instructional costs and Library holdings, arising from the attached Calendar changes

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- \Box New course(s):
- \Box Amended or deleted course(s):
 - BIOL 3750 (small name change)
 - BIOL 4701 (rename course and modify prerequisites)
- \Box New program(s):
- □ Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council: _____

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

COURSE NUMBER AND TITLE

BIOL 3750 - Animal Behaviour I BIOL 4701 - Animal Behaviour II

REVISED COURSE NUMBER AND TITLE

BIOL 3750 - Animal Behaviour BIOL 4701 - Behavioural Ecology

ABBREVIATED COURSE TITLE

Animal Behaviour Behavioural Ecology

RATIONALE

The rationale for this proposed course amendment decouple PSYC/BIOL 3750 as a pre-requisite from BIOL 4701. This amendment includes renaming BIOL 4701 to more accurately reflect current course content. Originally, PSYC/BIOL 3750 – Animal Behaviour I, was developed to introduce students to mechanisms of animal behaviour, a necessary prerequisite to BIOL 4701 which focussed on the evolutionary biology of behaviour. These long-running courses are now taught in such a way that it is not necessary to have 3750 (the course focused more on mechanistics) before taking 4701 (the ecologically focused course).

Since the name of Animal Behaviour II is proposed to change to Behavioural Ecology, it does not make sense to call 3750 "Animal Behaviour I" (there is not longer a "II") and thus we make a small cosmetic change to the title of 3750.

CALENDAR CHANGES

13.2 Biology 3750

Animal Behaviour I

(same as Psychology 3750) is an introduction to the mechanisms, development, function and evolution of behaviour in animals. Topics include the history of ethology and comparative psychology, and behavioural ecology; methods of animal behaviour study, behaviour of animals in relation to physiology, learning, communication, mating systems, and other areas in Biology and Psychology.

CR: Psychology 3750

PR: BIOL 1001 and 1002; Statistics 2550 or any of the courses listed in the credit restrictions of Statistics 2550

4701 Animal Behaviour II Behavioural Ecology

(same as Psychology 4701) is an examination of the behaviour of animals with particular emphasis on evolution and ecology. Topics include behavioural genetics and evolution, reproductive strategies, social behaviour, habitat selection, territoriality, foraging behaviour, and other topics in biology and psychology.

- CR: Psychology 4701
- LH: 3 Three hours of laboratory/seminar/discussion per week
- PR: BIOL 3750 or Psychology 3750BIOL 2600 and 2900

CALENDAR ENTRY AFTER CHANGES

3750

Animal Behaviour

(same as Psychology 3750) is an introduction to the mechanisms, development, function and evolution of behaviour in animals. Topics include the history of ethology and comparative psychology, and behavioural ecology; methods of animal behaviour study, behaviour of animals in relation to physiology, learning, communication, mating systems, and other areas in Biology and Psychology.

CR: Psychology 3750

PR: BIOL 1001 and 1002; Statistics 2550 or any of the courses listed in the credit restrictions of Statistics 2550

4701

Behavioural Ecology

(same as Psychology 4701) is an examination of the behaviour of animals with particular emphasis on evolution and ecology. Topics include behavioural genetics and evolution, reproductive strategies, social behaviour, habitat selection, territoriality, foraging behaviour, and other topics in biology and psychology.

CR: Psychology 4701

LH: Three hours of laboratory/seminar/discussion per week

PR: BIOL 2600 and BIOL 2900

SECONDARY CALENDAR CHANGES

13.11 Psychology

13.11.2 Majors Courses

3750

Animal Behaviour-I

(same as Biology 3750) is an introduction to the mechanisms, development, function and evolution of behaviour in animals. Topics include the history of ethology and comparative psychology, and behavioural ecology; methods of animal behaviour study, behaviour of animals in relation to physiology, learning, communication, mating systems, and other areas in Biology and Psychology.

CR: Biology 3750

PR: Biology 1001, 1002 and PSYC 2520 or 2521, 2911, and 2930 or the former 2570, and admission to a Major in Psychology or Behavioural Neuroscience

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

CONSULTATIONS SOUGHT

From

Response Received

Grenfell campus Faculty of Business Administration Faculty of Education Faculty of Engineering & Applied Science Faculty of Humanities & Social Sciences Faculty of Science **Department of Biochemistry** Department of Chemistry **Department of Computer Sciences Department of Earth Sciences Department of Economics** Department of Geography **Department of Mathematics and Statistics** Department of Physics and Physical Oceanography Department of Psychology Yes - approve Marine Institute School of Human Kinetics and Recreation School of Medicine School of Nursing School of Pharmacy School of Social Work

RESOURCE IMPLICATIONS

There are no resource implications associated with the proposed changes.

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

COURSE NUMBER AND TITLE

BIOL 3711 – Principles of Marine Biology

BIOL 3714 – Estuarine Fish Ecology Field Course

BIOL 3715 - Ecology and Evolution of Fishes

RATIONALE

This proposal aims to cross-list a number of Biology courses to Ocean Sciences.

CALENDAR CHANGES

3711 Principles of Marine Biology (same as Ocean Sciences 3711) is an introductory course in biology of the oceans. Introduces students to marine habitats and the organisms that inhabit them, emphasizing functional morphology, physiology, biodiversity, phylogeny, and ecology. Also includes introduction to marine biogeography, conservation, fisheries and pollution.

CR: Ocean Sciences 3711

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

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

PR: Science 1807 and Science 1808; BIOL 2122, BIOL 2600

3714 Estuarine Fish Ecology Field Course (same as Ocean Sciences 3714)

examines community structure, function and distribution of northern coastal fishes in fjords and estuarine environments. Emphasis on sampling, field techniques, taxonomy, quantitative characterization, adaptations and habitat relationships. A comparative approach will contrast fish communities from other areas. To be held as a two week field course.

CR: Ocean Sciences 3714

PR: Science 1807 and Science 1808; BIOL 2600

3715 Ecology and Evolution of Fishes (same as Ocean Sciences 3715) examines the evolutionary history and ecology of the world's fishes, with particular emphasis on those of ecological, economical and cultural importance to Eastern Canada. Topics will include taxonomy, life histories, behaviour, zoogeography, evolutionary ecology, population biology, contemporary evolution, and conservation biology.

CR: the former BIOL 4600Ocean Sciences 3715

LH: 3

PR: Science 1807 and Science 1808; BIOL 2600 and 2900

CALENDAR ENTRY AFTER CHANGES

3711 Principles of Marine Biology (same as Ocean Sciences 3711) is an introductory course in biology of the oceans. Introduces students to marine habitats and the organisms that inhabit them, emphasizing functional morphology, physiology, biodiversity, phylogeny, and ecology. Also includes introduction to marine biogeography, conservation, fisheries and pollution.

CR: Ocean Sciences 3711

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

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

PR: Science 1807 and Science 1808; BIOL 2122, BIOL 2600

3714 Estuarine Fish Ecology Field Course (same as Ocean Sciences 3714)

examines community structure, function and distribution of northern coastal fishes in fjords and estuarine environments. Emphasis on sampling, field techniques, taxonomy, quantitative characterization, adaptations and habitat relationships. A comparative approach will contrast fish communities from other areas. To be held as a two week field course.

CR: Ocean Sciences 3714

PR: Science 1807 and Science 1808; BIOL 2600

3715 Ecology and Evolution of Fishes (same as Ocean Sciences 3715) examines the evolutionary history and ecology of the world's fishes, with particular emphasis on those of ecological, economical and cultural importance to Eastern Canada. Topics will include taxonomy, life histories, behaviour, zoogeography, evolutionary ecology, population biology, contemporary evolution, and conservation biology.

CR: Ocean Sciences 3715

LH: 3

PR: Science 1807 and Science 1808; BIOL 2600 and 2900

SECONDARY CALENDAR CHANGES

13.9 Ocean Sciences (new entries)

3711 Principles of Marine Biology (same as Biology 3711) is an introductory course in biology of the oceans. Introduces students to marine habitats and the organisms that inhabit them, emphasizing functional morphology, physiology, biodiversity, phylogeny, and ecology. Also includes introduction to marine biogeography, conservation, fisheries and pollution.

CR: Biology 3711

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

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

PR: Science 1807 and Science 1808; BIOL 2122, BIOL 2600

3714 Estuarine Fish Ecology Field Course (same as Biology 3714) examines community structure, function and distribution of northern coastal fishes in fjords and estuarine environments. Emphasis on sampling, field techniques, taxonomy, quantitative characterization, adaptations and habitat relationships. A comparative

approach will contrast fish communities from other areas. To be held as a two week field course.

CR: Biology 3714

PR: Science 1807 and Science 1808; BIOL 2600

3715 Ecology and Evolution of Fishes (same as Biology 3715) examines the evolutionary history and ecology of the world's fishes, with particular emphasis on those of ecological, economical and cultural importance to Eastern Canada. Topics will include taxonomy, life histories, behaviour, zoogeography, evolutionary ecology, population biology, contemporary evolution, and conservation biology. CR: Biology 3715 LH: 3 PR: Science 1807 and Science 1808; BIOL 2600 and 2900

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

CONSULTATIONS SOUGHT

From

Response Received

Yes - supportive

Grenfell campus Faculty of Business Administration Faculty of Education Faculty of Engineering & Applied Science Faculty of Humanities & Social Sciences Faculty of Science Department of Biochemistry Department of Chemistry **Department of Computer Sciences Department of Earth Sciences** Department of Economics Department of Geography **Department of Mathematics and Statistics Department of Ocean Sciences** Department of Physics and Physical Oceanography Department of Psychology Marine Institute School of Human Kinetics and Recreation School of Medicine School of Nursing School of Pharmacy School of Social Work

Soliciting email:

From: deansciassistant Sent: Friday, November 4, 2022 11:42 AM To: BiocDHundergrad; Biology Academic Program Officer; Charles Mather; CS General; Department of Chemistry Consult; Hunt, Donna M.; Gagnon, Patrick; Goulding, Rick; Hyde, Cathy; Ivan Saika-Voivod; Joseph Jacob; Kavanagh, Julie; Power, Keith B; Mackenzie, Theresa; mathconsult@mun.ca; mhatcher@mun.ca; Morrill, Penny L; Newhook, Rebecca; psychdeputyhead@mun.ca; Associate Dean of Science (Undergraduate); Wiersma, Yolanda Subject: FW: Biology documents for consultation From: Wiersma, Yolanda <ywiersma@mun.ca> Sent: Friday, November 4, 2022 11:35 AM To: deansciassistant <deansciassistant@mun.ca> Subject: Biology documents for consultation

Hi Cherie,

Please send the attached documents from the Biology Undergraduate Committee out for consultation. Feedback can be sent to me (ywiersma@mun.ca). Please send feedback by Monday November 21.

Thanks,

Yolanda

Dr. Yolanda F. Wiersma, PhD (she/her) Professor and Deputy Head (Undergraduate)

I support my union's efforts to achieve a fair deal. We are MUNFA!

Department of Biology Memorial University of Newfoundland and Labrador St. John's, NL, Canada

Ph. 709.864.7499 Cell. 709.986.8543

https://nllandscapeecology.com/

Response received:

Hi Andrew,

Thank you for the opportunity to provide feedback on this Biology proposal to cross-list three of its 3000-level courses with Ocean Sciences. The Department of Ocean Sciences sees lots of benefits for its own curricula and, therefore, is in total support of it.

Best Pat

Dr. Patrick Gagnon Professor and Deputy Head (Undergraduate) Department of Ocean Sciences Ocean Sciences Centre, Memorial University of Newfoundland St. John's, NL, A1C 5S7, Canada

Tel: (709) 864-7663 Fax: (709) 864-3220 Email: pgagnon@mun.ca

From: BiocDHundergrad <<u>biocdhundergrad@mun.ca</u>>
Sent: Sunday, November 6, 2022 5:09 PM
To: Wiersma, Yolanda <<u>ywiersma@mun.ca</u>>
Cc: Booth, Valerie <<u>vbooth@mun.ca</u>>
Subject: Fw: Biology documents for consultation

Hi Yolanda,

On behalf of Biochemistry, I have reviewed the seven calendar change proposals sent out for consultation by Biology. I see no impact on our program or courses, so I have no concerns.

Cheers, Janet

Janet Brunton, PhD Professor and Deputy Head (Undergraduate) Department of Biochemistry Memorial University of Newfoundland

phone 709 864-8533 fax: 709 864-2422

LIBRARY REPORT

Not required.

RESOURCE IMPLICATIONS

This proposal aims to cross-list currently offered courses and therefore impose no additional resource implications on either Biology or Ocean Sciences.

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- \Box New course(s):
- X Amended or deleted course(s):
 - BIOL 4650/GEOG 4650
- □ New program(s):
- \Box Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council: _____

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

COURSE NUMBER AND TITLE

BIOL 4650/GEOG 4650 – Conservation Biology I: Conservation in Biology & Geography

REVISED COURSE NUMBER AND TITLE

BIOL 3650/GEOG 3650 - Conservation Biology I: Introduction to Conservation

ABBREVIATED COURSE TITLE

Cons Biol I

RATIONALE

This course has evolved over time such that the current calendar description does not match what is being offered. As well, this calendar description change along with the concurrent changes we are proposing to BIOL/GEOG 4651 and BIOL 4306 help delineate the key differences between the material covered in Conservation Biology I, Conservation Biology II and Applied Ecology. The breadth covered by the class is more consistent with a 3rd year class, and the students draw upon concepts and skills they would normally learn in 2nd year core courses (Biology 2600, 2900; Geography 2102, 2195, 2425). More advanced analyses such as population viability analysis or detailed biodiversity mapping that might have drawn on Biology 3295, Population Ecology, or Geography 3260, Geographic Information Systems, have been dropped. Effectively, the course is now being taught at a 3rd year level, and leads to a 4th year advanced course in Conservation in Practice (BIOL 4651), or 4th year courses in Recreational Resource Planning (GEOG 4405) or Research Seminar in Resources (GEOG 4410), which focuses on Environmental Impact Assessment. Thus we are requesting to drop this to a 3rd-year level course.

CALENDAR CHANGES

13.2 Biology

3650 Conservation Biology I: <u>Introduction to</u> **Conservation** in Biology and Geography (same as <u>Geography</u> 3650) is an examination introductory <u>course surveying the broad and evolving discipline of</u> <u>Conservation Science. Students examine</u> how basic biological and geographic principles can be applied to the conservation of biological diversity in the natural world under conditions of exploitation, habitat loss, <u>and</u> <u>climate change.</u> <u>Topics covered may include biodiversity assessment, endangered species assessment,</u> <u>threats to biodiversity, Indigenous-led conservation, protected areas, systematic conservation planning, and conservation economics, legislation and policy</u>. Special emphasis is given to relevant provincial examples.

CR: Geography 3650

PR: 30 credit hours in either Biology or Geography; BIOL 2600 and 2900, or Geography 2102 and 2425, or permission of instructor.

CALENDAR ENTRY AFTER CHANGES

3650 Conservation Biology I: Introduction to Conservation (same as Geography 3650) is an introductory course surveying the broad and evolving discipline of Conservation Science. Students examine how basic biological and geographic principles are applied to the conservation of biological diversity in the natural world under conditions of exploitation, habitat loss, and climate change. Topics covered may include biodiversity assessment, endangered species assessment, threats to biodiversity, Indigenous-led conservation, protected areas, systematic conservation planning, and conservation economics, legislation and policy. Special emphasis is given to relevant provincial examples.

PR: BIOL 2600 and 2900, or Geography 2102 and 2425, or permission of instructor. CR: Geography 3650

SECONDARY CALENDAR CHANGES

11.2.5.1 Applied Ecology and Conservation

Students selecting an Applied Ecology and Conservation concentration are required to complete 18 credit hours from the following courses:

1. Biology 4122, 4307, 4360, 4405, <u>3650</u>4650, 4651, 4710, 4810, 4820, 4911

Faculty of Humanities and Social Sciences 16.11 Geography

3650 Conservation Biology I: <u>Introduction to</u> <u>Conservation in Biology and Geography</u> (same as <u>Biology 3650) is an examination</u> introductory <u>course surveying the broad and evolving discipline of</u> <u>Conservation Science. Students examine</u> how basic biological and geographic principles can be applied to the conservation of biological diversity in the natural world under conditions of exploitation, habitat loss, <u>and</u> <u>climate change.</u> <u>Topics covered may include biodiversity assessment, endangered species assessment, threats to biodiversity, Indigenous-led conservation, protected areas, systematic conservation planning, and conservation economics, legislation and policy. Special emphasis is given to relevant provincial examples.</u>

CR: Geography 3650

PR: 30 credit hours in either Biology or Geography; BIOL 2600 and 2900, or Geography 2102 and 2425, or permission of instructor.

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

CONSULTATIONS SOUGHT

From

Response Received

Grenfell campus Faculty of Business Administration Faculty of Education Faculty of Engineering & Applied Science Faculty of Humanities & Social Sciences Faculty of Science Department of Biochemistry Department of Chemistry **Department of Computer Sciences Department of Earth Sciences Department of Economics** Department of Geography **Department of Mathematics and Statistics** Department of Physics and Physical Oceanography Department of Psychology Yes - approve Marine Institute School of Human Kinetics and Recreation School of Medicine School of Nursing School of Pharmacy School of Social Work

RESOURCE IMPLICATIONS

There are no resource implications associated with the proposed changes.

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- \Box New course(s):
- X Amended or deleted course(s):
- BIOL 4651
- \Box New program(s):
- \Box Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council:

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

COURSE NUMBER AND TITLE

BIOL 4651 - Conservation Biology II: Conservation in Practice

REVISED COURSE NUMBER AND TITLE

No change

ABBREVIATED COURSE TITLE

Cons Biol II

RATIONALE

This course has evolved over time such that the current calendar description does not match what is being offered. As well, this calendar description change along with the concurrent changes to BIOL/GEOG 4650 and BIOL 4306 help delineate the key differences between the material covered in Conservation Biology I, Conservation Biology II and Applied Ecology.

CALENDAR CHANGES

13.2 Biology

4651 Conservation Biology II: Conservation in Practice

(same as Geography 4651) examines issues relevant toteaches non-academic skills beneficial to anyone considering a career in global conservation science. Topics will be covered through a series of modules, including conservation genetics, costs and consequences of small populations, effects of anthropogenic activity on biodiversity, spatial dynamicsscience communication, Geographic Information Systems, quantitative skills, interactions with government, ENGOs and museum, working with Indigenous partnerships, and the interface between science and society. PR: BIOL 2900, 3295 and 4650 or Geography 3650 CR: Geography 4651

CALENDAR ENTRY AFTER CHANGES

4651 Conservation Biology II: Conservation in Practice

(same as Geography 4651) teaches non-academic skills beneficial to anyone considering a career in conservation. Topics will be covered through a series of modules, including science communication, Geographic Information Systems, quantitative skills, interactions with government, ENGOs and museum, working with Indigenous partnerships, and the interface between science and society. PR: BIOL 2900, 3295 and one of BIOL 3650 or Geography 3650 CR: Geography 4651

SECONDARY CALENDAR CHANGES

16.11 Geography

4651 Conservation Biology II: Conservation in Practice

(same as Biology 4651) teaches non-academic skills beneficial to anyone considering a career in conservation. Topics will be covered through a series of modules, including science communication, Geographic Information Systems, quantitative skills, interactions with government, ENGOs and museum, working with Indigenous partnerships, and the interface between science and society. PR: Biology 2900, 3295 and one of Biology 3650 or GEOG 3650 CR: Biology 4651
Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

CONSULTATIONS SOUGHT

From

Response Received

Grenfell campus Faculty of Business Administration Faculty of Education Faculty of Engineering & Applied Science Faculty of Humanities & Social Sciences Faculty of Science Department of Biochemistry Department of Chemistry **Department of Computer Sciences Department of Earth Sciences Department of Economics** Department of Geography **Department of Mathematics and Statistics** Department of Physics and Physical Oceanography Department of Psychology Yes - approve Marine Institute School of Human Kinetics and Recreation School of Medicine School of Nursing School of Pharmacy School of Social Work

Yes - supportive

RESOURCE IMPLICATIONS

There are no resource implications associated with the proposed changes.

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- \square New course(s):
- X Amended or deleted course(s): BIOL 3710 Biological Oceanography
- \Box New program(s):
- \Box Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council: _____

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

COURSE NUMBER AND TITLE

BIOL 3710 - Biological Oceanography

REVISED COURSE NUMBER AND TITLE

BIOL 3710 - Laboratory Methods in Biological Oceanography

ABBREVIATED COURSE TITLE

Lab Methods Biol Ocean

RATIONALE

The proposed changes to BIOL 3710 (Biological Oceanography) will eliminate overlap with OCSC 2000 while also filling a gap in the undergraduate curriculum of both Biology and Ocean Sciences. This proposal aims to replace the current BIOL 3710 with a course focussing on laboratory methods in Biological Oceanography which currently does not exist in either department.

In this redesigned course, students will use a practical laboratory framework to build on their understanding of the key biological processes occurring in the ocean and the temporal and spatial scales at which they operate and interact with each other. Students will also develop an understanding of how the biota of different Oceanic regions interact, and how these interactions tie into global processes including climate feedbacks, ocean food webs, and biogeochemical cycling. Students will gain a greater facility and understanding with mathematical representations of oceanographic concepts. Finally, students will learn fundamentals of the open-source Python programming language and apply these to current problems in microbial oceanography. As part of redesigning this course, BIOL 3710 will move from a 3 hour lecture/3 hour lab to a 3 hour single block per week, primarily taught in an experiential lab-based format.

CALENDAR CHANGES

3710 Biological Oceanography Laboratory Methods in Biological Oceanography is an introductory course in biotic and abiotic factors controlling marine biomass and primary production, emphasizing plankton and fishes. It introduces students to major groups of marine phytoplankton, zooplankton, and fishes, emphasizing how the physical, chemical, and geological environments interact with biology to define processes and pattern in marine organisms. (same as Ocean Sciences 3710) uses a practical laboratory-based approach to investigate interactions between marine life and their ocean environment and is intended for students of biology and ocean science. Both experimental and computer-based modelling labs will cover topics such as historical and modern approaches for investigating planktonic life, life in and near the seafloor, and life in the sea surface microlayer.

CR: Ocean Sciences 20003710

PR: Science 1807 and Science 1808; BIOL 2122 and 2600 Ocean Sciences 2000

CALENDAR ENTRY AFTER CHANGES

BIOL 3710 Laboratory Methods in Biological Oceanography (same as Ocean Sciences 3710) uses a practical laboratory-based approach to investigate interactions between marine life and their ocean environment and is intended for students of biology and ocean science. Both experimental and computer-based modelling labs will cover topics such as historical and modern approaches for investigating planktonic life, life in and near the seafloor, and life in the sea surface microlayer.

CR: Ocean Sciences 3710 PR: Science 1807 and Science 1808; Ocean Sciences 2000

SECONDARY CALENDAR CHANGES

Before Changes:

10 Joint Program Regulations

10.1.13.2 Program of Study

8. Biology 1001, 1002, 2060, 2122, 2250 (or Biochemistry 2100), 2600, 2900, 3710 (or Ocean Sciences 2000) and 3711;

9. Ocean Sciences 1000, 2000 (or Biology 3710), 2001, 2100, and at least one of 2500 or 4500 (or Biology 4710);

10.2.21 Marine Biology Joint Honours

The program is jointly administered by the Department of Ocean Sciences and the Department of Biology. To be eligible for admission, students would normally follow the requirements for the Joint Major in Marine Biology. Specifically, students must have successfully completed Biology 2060, 2250, 2600, and 2900 and Ocean Sciences 2000 (or Biology 3710), 2001, 2100 and 2300 and obtained in these courses a grade of "B" or better, or an average of 75% or higher. Selection is based on academic performance in the required courses.

8. Biology 1001, 1002, 2060, 2122, 2250 (or Biochemistry 2100), 2600, 2900, **3710** (or Ocean Sciences 2000) and 3711;

9. Ocean Sciences 1000, 2000 (or Biology 3710), 2001, 2100, 2300 and at least one of 2500 or 4500 (or Biology 4710);

11.9 Ocean Sciences

11.9.1 Minor in Oceanography

Students who take a Minor in Oceanography will complete 24 credit hours as follows:

- 1. Ocean Sciences 1000, <u>2000,</u> 2100, 2200, 2300;
- 2. Ocean Sciences 2000 or Biology 3710;
- 3. Earth Sciences 1000; and
- 4. Six credit hours that can be selected from:

- 1. Biology 3014, 3709, <u>3710,</u> 3711, 3712, 3714, 3715, 4122, 4601, 4710, 4750, 4810;
- 2. Chemistry 2100, 3110, 4151, 4156;
- 3. Earth Sciences 4302, 4420;
- 4. Geography 3120, 3510, 4190, 4300;
- 5. Environmental Science 3072, 3210, 3211, 4230;
- 6. Ocean Sciences 2001, 3000, 3002, 3600, 4000, 4122, 4300, 4601;
- 7. Physics and Physical Oceanography 3300, 3340, 4300, 4340; and
- 8. Other applicable ocean-related courses, as approved by the Head of the Department (or delegate).

11.9.2 Minor in Sustainable Aquaculture and Fisheries Ecology

2. six credit hours selected from: Ocean [Grab your reader's attention with a great quote from the document or use this space to emphasize a key point. To place this text box anywhere on the page, just drag it.]

Sciences 2000 (or Biology 3710), 3600, 3640, 4000, 4122, 4200, 4601, or other applicable courses at the 3000 level or above, as approved by the Head of the Department or delegate;

3. three credit hours selected from:

- 1. Biology 2122, 3401, 3640, <u>3710, 3715, 4251, 4605, 4750;</u>
- 2. Biochemistry 3107, 3402, 4002, 4101, 4104, 4105, 4200, 4201;
- 3. Geography 4300.

11.9.3.2 Program Regulations for the Major in Ocean Sciences

4. a minimum of 30 credit hours in Ocean Sciences, including:

a. Ocean Sciences 2000 (or Biology 3710), 2001, 2100 and at least one of 2500 or 4500 (or Biology 4710). Ocean Sciences 1000, successfully completed under Admission Requirements for the Major in Ocean Sciences or the Major in Ocean Sciences (Environmental Systems), will count as 3 of the required 30 credit hours in Ocean Sciences;

11.9.3.3 Program Regulations for the Major in Ocean Sciences (Environmental Systems)

7. a minimum of 30 credit hours in Ocean Sciences, including:

a. Ocean Sciences 2000 (or Biology 3710), 2001, 2100 and at least one of 2500 or 4500 (or Biology 4710). Ocean Sciences 1000, successfully completed under Admission Requirements for the Major in Ocean Sciences or the Major in Ocean Sciences (Environmental Systems), will count as 3 of the required 30 credit hours in Ocean Sciences;

11.9.4.2 Program Regulations for the Honours in Ocean Sciences

6. a minimum of 45 credit hours in Ocean Sciences, including:

a. Ocean Sciences 2000 (or Biology 3710), 2001, 2100, 2200, 2300 and at least one of 2500 or 4500 (or Biology 4710). Ocean Sciences 1000, successfully completed under Admission Requirements for the Major in Ocean Sciences or the Major in Ocean Sciences (Environmental Systems), will count as 3 of the required 45 credit hours in Ocean Sciences;

13.9 Ocean Sciences

2000 Introductory Biological Oceanography provides a general understanding of the biological processes that occur in coastal and oceanic environments. It introduces students to the major groups of bacteria, phytoplankton, invertebrates and fish, emphasizing the biotic and abiotic factors controlling primary production and marine

biomass. It shows how the physical, chemical, and geological environments interact with biology to define processes and patterns affecting nutrients and life in marine ecosystems.

PR: OCSC 1000 and a 1000-level course in one of Biology, Chemistry, Earth Sciences or Physics (or Biology 1001 and 1002)

3710 Biological Oceanography Laboratory Methods in Biological Oceanography is an introductory course in biotic and abiotic factors controlling marine biomass and primary production, emphasizing plankton and fishes. It introduces students to major groups of marine phytoplankton, zooplankton, and fishes, emphasizing how the physical, chemical, and geological environments interact with biology to define processes and pattern in marine organisms. (same as Biology 3710) uses a practical laboratory-based approach to investigate interactions between marine life and their ocean environment and is intended for students of biology and ocean science. Both experimental and computer-based modelling labs will cover topics such as historical and modern approaches for investigating planktonic life, life in and near the seafloor, and life in the sea surface microlayer.

CR: Biology 20003710

PR: Science 1807 and Science 1808; BIOL 2122 and 2600 Ocean Sciences 2000

After Changes:

10 Joint Program Regulations

10.1.13.2 Program of Study

8. Biology 1001, 1002, 2060, 2122, 2250 (or Biochemistry 2100), 2600, 2900, 3710 and 3711;

9. Ocean Sciences 1000, 2000, 2001, 2100, and at least one of 2500 or 4500 (or Biology 4710);

10.2.21 Marine Biology Joint Honours

The program is jointly administered by the Department of Ocean Sciences and the Department of Biology. To be eligible for admission, students would normally follow the requirements for the Joint Major in Marine Biology. Specifically, students must have successfully completed Biology 2060, 2250, 2600, and 2900 and Ocean Sciences 2000, 2001, 2100 and 2300 and obtained in these courses a grade of "B" or better, or an average of 75% or higher. Selection is based on academic performance in the required courses.

8. Biology 1001, 1002, 2060, 2122, 2250 (or Biochemistry 2100), 2600, 2900, 3710 and 3711;

9. Ocean Sciences 1000, 2000, 2001, 2100, 2300 and at least one of 2500 or 4500 (or Biology 4710);

11.9 Ocean Sciences

11.9.1 Minor in Oceanography

Students who take a Minor in Oceanography will complete 24 credit hours as follows:

- 5. Ocean Sciences 1000, 2000, 2100, 2200, 2300;
- 6. Earth Sciences 1000; and
- 7. Six credit hours that can be selected from:
 - 1. Biology 3014, 3709, 3710, 3711, 3712, 3714, 3715, 4122, 4601, 4710, 4750, 4810;
 - 2. Chemistry 2100, 3110, 4151, 4156;
 - 3. Earth Sciences 4302, 4420;
 - 4. Geography 3120, 3510, 4190, 4300;
 - 5. Environmental Science 3072, 3210, 3211, 4230;
 - 6. Ocean Sciences 2001, 3000, 3002, 3600, 4000, 4122, 4300, 4601;
 - 7. Physics and Physical Oceanography 3300, 3340, 4300, 4340; and
 - 8. Other applicable ocean-related courses, as approved by the Head of the Department (or delegate).

11.9.2 Minor in Sustainable Aquaculture and Fisheries Ecology

2. six credit hours selected from: Ocean Sciences 2000, 3600, 3640, 4000, 4122, 4200, 4601, or other applicable courses at the 3000 level or above, as approved by the Head of the Department or delegate;

- 3. three credit hours selected from:
 - 4. Biology 2122, 3401, 3640, 3710, 3715, 4251, 4605, 4750;
 - 5. Biochemistry 3107, 3402, 4002, 4101, 4104, 4105, 4200, 4201;
 - 6. Geography 4300.

11.9.3.2 Program Regulations for the Major in Ocean Sciences

4. a minimum of 30 credit hours in Ocean Sciences, including:

a. Ocean Sciences 2000, 2001, 2100 and at least one of 2500 or 4500 (or Biology 4710). Ocean Sciences 1000, successfully completed under Admission Requirements for the Major in Ocean Sciences or the Major in Ocean Sciences (Environmental Systems), will count as 3 of the required 30 credit hours in Ocean Sciences;

11.9.3.3 Program Regulations for the Major in Ocean Sciences (Environmental Systems)

7. a minimum of 30 credit hours in Ocean Sciences, including:

a. Ocean Sciences 2000, 2001, 2100 and at least one of 2500 or 4500 (or Biology 4710). Ocean Sciences 1000, successfully completed under Admission Requirements for the Major in Ocean Sciences or the Major in Ocean Sciences (Environmental Systems), will count as 3 of the required 30 credit hours in Ocean Sciences;

11.9.4.2 Program Regulations for the Honours in Ocean Sciences

6. a minimum of 45 credit hours in Ocean Sciences, including:

a. Ocean Sciences 2000, 2001, 2100, 2200, 2300 and at least one of 2500 or 4500 (or Biology 4710). Ocean Sciences 1000, successfully completed under Admission Requirements for the Major in Ocean Sciences or the Major in Ocean

Sciences (Environmental Systems), will count as 3 of the required 45 credit hours in Ocean Sciences;

13.9 Ocean Sciences

2000 Introductory Biological Oceanography provides a general understanding of the biological processes that occur in coastal and oceanic environments. It introduces students to the major groups of bacteria, phytoplankton, invertebrates and fish, emphasizing the biotic and abiotic factors controlling primary production and marine biomass. It shows how the physical, chemical, and geological environments interact with biology to define processes and patterns affecting nutrients and life in marine ecosystems.

PR: OCSC 1000 and a 1000-level course in one of Biology, Chemistry, Earth Sciences or Physics (or Biology 1001 and 1002)

BIOL 3710 Laboratory Methods in Biological Oceanography (same as Biology 3710) uses a practical laboratory-based approach to investigate interactions between marine life and their ocean environment and is intended for students of biology and ocean science. Both experimental and computer-based modelling labs will cover topics such as historical and modern approaches for investigating planktonic life, life in and near the seafloor, and life in the sea surface microlayer.

CR: Biology 3710 PR: Science 1807 and Science 1808; Ocean Sciences 2000

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

CONSULTATIONS SOUGHT

From

Response Received

Grenfell campus Faculty of Business Administration Faculty of Education Faculty of Engineering & Applied Science Faculty of Humanities & Social Sciences Faculty of Science Department of Biochemistry Department of Chemistry **Department of Computer Sciences Department of Earth Sciences** Department of Economics Department of Geography **Department of Mathematics and Statistics Department of Ocean Sciences** Yes - supportive Department of Physics and Physical Oceanography Department of Psychology Marine Institute School of Human Kinetics and Recreation School of Medicine School of Nursing School of Pharmacy School of Social Work

Responses received:

From: "Gagnon, Patrick" <<u>pgagnon@mun.ca</u>> Date: October 19, 2022 at 8:12:20 AM NDT To: "Wiersma, Yolanda" <<u>ywiersma@mun.ca</u>> Cc: Biology Academic Program Officer <<u>BioAPO@mun.ca</u>>, "Nichols, Danielle" <<u>dnichols@mun.ca</u>> Subject: Comments on draft proposal BIOL 3710

Hi Yolanda,

As promised I am attaching comments from OSCUP about the draft proposal for BIOL 3710 for BUGS consideration. Preliminary internal consultation following yesterday's meeting suggests DOS is amenable to the idea of cross listing OCSC 2000 with Biology. You can consider this a standing offer unless you hear back from me within the next few days. Happy to do it if it facilitates BIOL 3710 uptake (e.g. perhaps the need to

Paper 5.A.g. (pages 38-46) have OCSC 3711 as PR for BIOL 3710, which is a little counterintuitive or difficult to justify, could be abandoned) or any other aspects of Biology's curricula. While at it, I just want to reiterate that we are very interested in also cross listing BIOL 3710 with Ocean Sciences as this would also help our students meet our programs requirements.

Best Pat Dr. Patrick Gagnon Professor and Deputy Head (Undergraduate) Department of Ocean Sciences Ocean Sciences Centre, Memorial University of Newfoundland St. John's, NL, A1C 5S7, Canada Tel: (709) 864-7663 Fax: (709) 864-3220 Email: pgagnon@mun.ca

Soliciting email:

From: Wiersma, Yolanda <ywiersma@mun.ca> Sent: Friday, November 4, 2022 11:35 AM To: deansciassistant <deansciassistant@mun.ca> Subject: Biology documents for consultation

Hi Cherie, Please send the attached documents from the Biology Undergraduate Committee out for consultation. Feedback can be sent to me (ywiersma@mun.ca). Please send feedback by Monday November 21.

Thanks, Yolanda

Dr. Yolanda F. Wiersma, PhD (she/her) Professor and Deputy Head (Undergraduate)

I support my union's efforts to achieve a fair deal. We are MUNFA!

Department of Biology Memorial University of Newfoundland and Labrador St. John's, NL, Canada

Ph. 709.864.7499 Cell. 709.986.8543

LIBRARY REPORT

No change is expected with regards to Library holdings.

RESOURCE IMPLICATIONS

This course has been offered for the last number of years by a sessional instructor. The current proposal reflects the expertise of our newest faculty member who will be taking on this course in the coming academic year as part of their regular load. This proposal also reduces burden on space by switching to a 'flipped classroom' style and removing the need for a lecture space elsewhere on campus. Overall, the proposal will result in a net reduction in resource requirement compared to previous iterations of the course.

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- □ New course(s):
- \Box Amended or deleted course(s):
- □ New program(s):
- **X** Amended or deleted program(s):

Faculty of Science, Program Regulations, Biology, 11.2.3.1 Major in Biology Faculty of Science, Program Regulations, Biology, 11.2.4.1 Honours in Biology Faculty of Science, Joint Program Regulations, Joint Majors, 10.1.13 Marine Biology Joint Major

Faculty of Science, Joint Program Regulations, Joint Majors, 10.1.13 Marine Biology Joint Major

- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council:

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Programs

PROGRAM TITLE

Faculty of Science, Program Regulations, Biology, 11.2.3.1 Major in Biology Faculty of Science, Program Regulations, Biology, 11.2.4.1 Honours in Biology Faculty of Science, Joint Program Regulations, Joint Majors, 10.1.13 Marine Biology Joint Major

Faculty of Science, Joint Program Regulations, Joint Majors, 10.1.13 Marine Biology Joint Major

RATIONALE

The proposed changes reflect an increase in the number of course offered by Biology that do not include an additional 3 h lab/seminar component. Additionally, in recognition of the increased contact hours our Honours students are required to take, we have moved from a 9 CH limit for the number of courses without an associated lab which students can count as BIOL elective for all students to a limit set based on the total number of Biology elective CH required.

CALENDAR CHANGES

11.2 Biology

Details of joint programs are given in Joint Program Regulations.

Biology course descriptions are found at the end of the Faculty of Science section under Course Descriptions, Biology.

For the purposes of a Major, or Honours degree in Biology, Medicine 310A/B count as Biology courses.

For the purposes of determining Biology electives with associated laboratories/seminars, field and intensive courses will count as lecture/laboratory courses.

11.2.3.1 Major in Biology

A maximum of <u>half of all Biology electives</u>9 credit hours can be in Biology courses with no associated laboratory/seminar (i.e., courses that have 3 contact hours/week).

11.2.4.1 Honours in Biology

- 1. Biology Course Requirements:
 - d. A maximum of <u>half of all Biology electives</u>9 credit hours can be in Biology courses with no associated laboratory/seminar <u>(i.e., courses that have 3 contact hours/week)</u>.

10.1.13 Marine Biology Joint Major

10.1.13.2 Program of Study

Notes:

2. A maximum of <u>half of all Biology electives</u>9 credit hours can be in Biology courses with no associated laboratory/seminar <u>(i.e., courses that have 3 contact hours/week)</u>.

10.2.21 Marine Biology Joint Honours

A maximum of <u>half of all Biology electives</u> 2 credit hours can be in Biology courses with no associated laboratory/seminar <u>(i.e., courses that have 3 contact hours/week)</u>.

CALENDAR ENTRY AFTER CHANGES

11.2 Biology

Details of joint programs are given in Joint Program Regulations.

Biology course descriptions are found at the end of the Faculty of Science section under Course Descriptions, Biology.

For the purposes of a Major, or Honours degree in Biology, Medicine 310A/B count as Biology courses.

For the purposes of determining Biology electives with associated laboratories/seminars, field and intensive courses will count as lecture/laboratory courses.

11.2.3.1 Major in Biology

A maximum of half of all Biology electives can be Biology courses with no associated laboratory/seminar (i.e., courses that have 3 contact hours/week).

11.2.4.1 Honours in Biology

1. Biology Course Requirements:

d. A maximum of half of all Biology electives can be Biology courses with no associated laboratory/seminar (i.e., courses that have 3 contact hours/week)...

10.1.13 Marine Biology Joint Major 10.1.13.2 Program of Study

Notes:

2. A maximum of half of all Biology electives can be Biology courses with no associated laboratory/seminar (i.e., courses that have 3 contact hours/week).

10.2.21 Marine Biology Joint Honours

A maximum of half of all Biology electives can be Biology courses with no associated laboratory/seminar (i.e., courses that have 3 contact hours/week).

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

CONSULTATIONS SOUGHT

From

Response Received

Grenfell campus Faculty of Business Administration Faculty of Education Faculty of Engineering & Applied Science Faculty of Humanities & Social Sciences Faculty of Science Department of Biochemistry Department of Chemistry **Department of Computer Sciences Department of Earth Sciences** Department of Economics Department of Geography **Department of Mathematics and Statistics Department of Ocean Sciences** Department of Physics and Physical Oceanography Department of Psychology Marine Institute School of Human Kinetics and Recreation School of Medicine School of Nursing School of Pharmacy School of Social Work

LIBRARY REPORT

Not applicable.

RESOURCE IMPLICATIONS

There are no resource implications associated with the proposed changes.

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- X New course(s): STAT 1500 Introduction to Data Science
- \Box Amended or deleted course(s):
- □ New program(s):
- □ Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council: _____

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

COURSE NUMBER AND TITLE

STAT 1500 Introduction to Data Science

ABBREVIATED COURSE TITLE

Intro Data Sci

RATIONALE

There is a high demand in studying Data Science courses at North American universities. Our recent Faculty of Science Strategic Plan aims to have an interdisciplinary undergraduate option in data science for each program in the Faculty of Science. We propose the first-year Statistics 1500 - Introduction to Data Science course to introduce fundamental Data Science topics to our students, to meet the demand and to achieve the purpose of our Strategic Plan. Our university's students will have the option to learn some introductory level Data Science topics at their first year. The course will teach them different ways to learn from data and will help them to have a better understanding on the importance of statistical sciences in their first year.

CALENDAR CHANGES under 13.8.2 Statistics Courses

1500 Introduction to Data Science aims to teach fundamentals of data science. Emphasis will be placed on data visualization, data wrangling and summarizing data, statistical estimation and testing, regression modeling, supervised and unsupervised statistical learning. Standard data science software will be used to demonstrate the techniques.

PR: 3 credit hours in Mathematics or Statistics courses, or a combination of placement test and high school Mathematics scores acceptable to the Department

CALENDAR ENTRY AFTER CHANGES under 13.8.2 Statistics Courses

1500 Introduction to Data Science aims to teach fundamentals of data science. Emphasis will be placed on data visualization, data wrangling and summarizing data, statistical estimation and testing, regression modeling, supervised and unsupervised statistical learning. Standard data science software will be used to demonstrate the techniques.

PR: 3 credit hours in Mathematics or Statistics courses, or a combination of placement test and high school Mathematics scores acceptable to the Department

APPENDIX

Consultations Sought:

Academic Unit	Response Received
Humanities and Social Sciences	
Business Administration	
Education	
Engineering and Applied Science	Yes
Human Kinetics and Recreation	Yes
Marine Institute	
Medicine	
Music	
Nursing	Yes
Pharmacy	Yes
Science	
Biochemistry	
Biology	
Computer Science	
Earth Sciences	
Mathematics and Statistics	
Ocean Sciences	

Academic Unit	Response Received
Physics and Physical Oceanography	
Psychology	
Social Work	
Library	
Grenfell - Arts and Social Science	
Grenfell - Science and the Environment	Yes
Grenfell - Fine Arts	
Labrador Institute	

On 2022-10-24, 13:43, "Engineering Consult" <<u>engrconsult@mun.ca</u>> wrote:

Hi,

Thanks for giving us the opportunity to provide feedback on the calendar change proposal. The Faculty of Engineering and Applied Science Committee on Undergraduate Studies does not anticipate any impact of the proposed changes on engineering programs. Sincerely, Salim

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

```
On 2022-10-06 10:53, Booth, Ivan wrote:
> Hello Everyone,
>
>
       Mathematics and Statistics seeks consultation on two new
> undergraduate Statistics courses. They are Statistics 1500
> (Introduction to Data Science) and Statistics 4504 (Biostatistics).
> These are new courses in the area of data science that will replace
> existing courses. In particular, 1500 is a first year course with
> minimal pre-requisites (high school advanced math is sufficient) and
> so will be accessible to students in all programs.
>
       If you have a comment or feedback on the attached proposal,
>
> I would appreciate receiving it by November 3rd.
>
> Best Regards,
>
> Ivan Booth (he/him)
>
> Deputy Head (Undergraduate)
>
> Department of Math and Stats
>
> Memorial University
```

From: "Davis,Erin" <<u>emdavis@mun.ca</u>>
Date: Thursday, October 6, 2022 at 14:26
To: Ivan Booth <<u>ibooth@mun.ca</u>>
Subject: FW: Calendar Change Consultation: STAT1500 Introduction to Data Science + STAT4504
Biostatistics

Hello Ivan,

Thank you for the opportunity to comment on the proposed changes. Pharmacy has no concerns as these changes should not affect our students or programs.

Thanks, Erin --Erin Davis, PharmD Associate Dean Undergraduate Studies Associate Professor Memorial University School of Pharmacy T 709 864 8815 E <u>emdavis@mun.ca</u> From: Booth, Ivan [mailto:ibooth@mun.ca]

Sent: Thursday, October 6, 2022 10:53 AM

To: Faculty of Humanities and Social Sciences <<u>hss@mun.ca</u>>; Oldford, Erin <<u>eoldford@mun.ca</u>>; Furey, Edith <<u>efurey@mun.ca</u>>;<u>engrconsult@mun.ca</u>; HKR Dean

<<u>hkrdean@mun.ca</u>>; <u>deanofmedicine@med.mun.ca</u>; Karen Bulmer <<u>kbulmer@mun.ca</u>>; DeanNurse <<u>DeanNurse@mun.ca</u>>; <u>pharminfo@mun.ca</u>; Dean of Science <<u>deansci@mun.ca</u>>; adeanugradswk <<u>adeanugradswk@mun.ca</u>>; Library Correspondence

<<u>univlib@mun.ca</u>>; <u>kjacobse@grenfell.mun.ca</u>; <u>ssedean@grenfell.mun.ca</u>; <u>thennessey@grenfell.mun.ca</u>; <u>miugconsultations@mi.mun.ca</u>; Ashlee Cunsolo <<u>ashlee.cunsolo@mun.ca</u>>

Subject: Calendar Change Consultation: STAT1500 Introduction to Data Science + STAT4504 Biostatistics

Hello Everyone,

Mathematics and Statistics seeks consultation on two new undergraduate Statistics courses. They are Statistics 1500 (Introduction to Data Science) and Statistics 4504 (Biostatistics). These are new courses in the area of data science that will replace existing courses. In particular, 1500 is a first year course with minimal pre-requisites (high school advanced math is sufficient) and so will be accessible to students in all programs.

If you have a comment or feedback on the attached proposal, I would appreciate receiving it by November 3rd.

Best Regards, Ivan Booth (he/him) Deputy Head (Undergraduate) Department of Math and Stats Memorial University

From: "Pike, April" <<u>aprilpike@mun.ca</u>> Date: Saturday, October 8, 2022 at 09:18 To: Ivan Booth <<u>ibooth@mun.ca</u>> Subject: FW: Calendar Change Consultation: STAT1500 Introduction to Data Science + STAT4504 Biostatistics

Good morning Nursing has no concerns about these two courses, Regards, April

From: DeanNurse <<u>DeanNurse@mun.ca</u>>
Sent: Friday, October 7, 2022 12:17 PM
To: Pike, April <<u>aprilpike@mun.ca</u>>
Subject: FW: Calendar Change Consultation: STAT1500 Introduction to Data Science + STAT4504
Biostatistics

FYI J

From: Booth, Ivan <<u>ibooth@mun.ca</u>>
Sent: Thursday, October 6, 2022 10:53 AM
To:
Subject: Calendar Change Consultation: STAT1500 Introduction to Data Science + STAT4504 Biostatistics

Hello Everyone,

Mathematics and Statistics seeks consultation on two new undergraduate Statistics courses. They are Statistics 1500 (Introduction to Data Science) and Statistics 4504 (Biostatistics). These are new courses in the area of data science that will replace existing courses. In particular, 1500 is a first year course with minimal pre-requisites (high school advanced math is sufficient) and so will be accessible to students in all programs.

If you have a comment or feedback on the attached proposal, I would appreciate receiving it by November 3rd.

Best Regards, Ivan Booth (he/him) Deputy Head (Undergraduate) Department of Math and Stats Memorial University

From: HKR Dean <<u>hkrdean@mun.ca</u>>
Date: Tuesday, October 18, 2022 at 14:15
To: Ivan Booth <<u>ibooth@mun.ca</u>>
Subject: Re: Calendar Change Consultation: STAT1500 Introduction to Data Science + STAT4504
Biostatistics

Hello Ivan,

Thank you for the opportunity to review. HKR has reviewed and we have no concerns or comments.

Anne-Marie

Anne-Marie Sullivan (she/her), PhD, CTRS Interim Dean, School of Human Kinetics & Recreation Memorial University, St. John's, NL, A1S 5S7 (p) 709-864-8129; (e) <u>hkrdean@mun.ca</u>

We acknowledge that the lands on which Memorial University's campuses are situated are in the traditional territories of diverse Indigenous groups, and we acknowledge with respect the diverse histories and cultures of the Beothuk, Mi'kmaq, Innu, and Inuit of this province.

From: "Booth, Ivan" <<u>ibooth@mun.ca</u>>

Date: Thursday, October 6, 2022 at 10:53 AM

To: Faculty of Humanities and Social Sciences <<u>hss@mun.ca</u>>, "Oldford, Erin" <<u>eoldford@mun.ca</u>>, "Furey, Edith" <<u>efurey@mun.ca</u>>, "<u>engrconsult@mun.ca</u>" <<u>engrconsult@mun.ca</u>>, HKR Dean <<u>hkrdean@mun.ca</u>>, "<u>deanofmedicine@med.mun.ca</u>" <<u>deanofmedicine@med.mun.ca</u>>, Karen Bulmer

<<u>kbulmer@mun.ca</u>>, DeanNurse <<u>DeanNurse@mun.ca</u>>, "<u>pharminfo@mun.ca</u>" <<u>pharminfo@mun.ca</u>>, Dean of Science <<u>deansci@mun.ca</u>>, adeanugradswk <<u>adeanugradswk@mun.ca</u>>, Library Correspondence <<u>univlib@mun.ca</u>>, "<u>kjacobse@grenfell.mun.ca</u>" <<u>kjacobse@grenfell.mun.ca</u>>, "<u>ssedean@grenfell.mun.ca</u>" <<u>ssedean@grenfell.mun.ca</u>>, "<u>thennessey@grenfell.mun.ca</u>" <<u>thennessey@grenfell.mun.ca</u>>, "<u>miugconsultations@mi.mun.ca</u>" <<u>miugconsultations@mi.mun.ca</u>>, Ashlee Cunsolo <<u>ashlee.cunsolo@mun.ca</u>>

Subject: Calendar Change Consultation: STAT1500 Introduction to Data Science + STAT4504 Biostatistics

Hello Everyone,

Mathematics and Statistics seeks consultation on two new undergraduate Statistics courses. They are Statistics 1500 (Introduction to Data Science) and Statistics 4504 (Biostatistics). These are new courses in the area of data science that will replace existing courses. In particular, 1500 is a first year course with minimal pre-requisites (high school advanced math is sufficient) and so will be accessible to students in all programs.

If you have a comment or feedback on the attached proposal, I would appreciate receiving it by November 3rd.

Best Regards, Ivan Booth (he/him) Deputy Head (Undergraduate) Department of Math and Stats Memorial University

From: "Sveshnikov, Dmitry" <<u>dmitry.sveshnikov@grenfell.mun.ca</u>>
Date: Friday, November 4, 2022 at 13:15
To: Ivan Booth <<u>ibooth@mun.ca</u>>
Cc: Dean - School of Science and the Environment <<u>ssedean@grenfell.mun.ca</u>>
Subject: RE: Calendar Change Consultation: STAT1500 Introduction to Data Science + STAT4504 Biostatistics

Dear Professor Booth, A slightly late (but positive) note:

The SSE Committee on Academic Programming has reviewed the materials for the following calendar change proposal:

• Statistics 1500 (Introduction to Data Science) and Statistics 4504 (Biostatistics).

The Committee has no concerns, and we have not heard any from the potentially interested programs. As a personal note, should such courses be offered online/remotely, we'll be happy to advertise them to our students at Grenfell.

Thank you,

Dmitry Sveshnikov (Chair of SSE-CAP)

Dmitry Sveshnikov, Assoc. Professor Environmental Science / Biology School of Science and the Environment Grenfell Campus Memorial University of Newfoundland 20 University Drive, Corner Brook Newfoundland, Canada, A2H 5G4

Office: AS213 Phone: +1(709)639-6528 (leave a message) Email: <u>dmitry.sveshnikov@grenfell.mun.ca</u>

From: Booth, Ivan <<u>ibooth@mun.ca</u>> Sent: October 6, 2022 10:53 AM To: Faculty of Humanities and Social Sciences <<u>hss@mun.ca</u>>; Oldford, Erin <<u>eoldford@mun.ca</u>>; Furey, Edith <<u>efurey@mun.ca</u>>;<u>engrconsult@mun.ca</u>; HKR Dean <<u>hkrdean@mun.ca</u>>; <u>deanofmedicine@med.mun.ca</u>; Karen Bulmer <<u>kbulmer@mun.ca</u>>; DeanNurse <<u>DeanNurse@mun.ca</u>>; <u>pharminfo@mun.ca</u>; Dean of Science <<u>deansci@mun.ca</u>>; adeanugradswk <<u>adeanugradswk@mun.ca</u>>; Library Correspondence <<u>univlib@mun.ca</u>>; Jacobsen, Ken <<u>kjacobse@grenfell.mun.ca</u>>; Dean - School of Science and the Environment <<u>ssedean@grenfell.mun.ca</u>>; Hennessey, Todd <<u>THENNESSEY@grenfell.mun.ca</u>>; <u>miugconsultations@mi.mun.ca</u>; Ashlee Cunsolo <<u>ashlee.cunsolo@mun.ca</u>>

Subject: Calendar Change Consultation: STAT1500 Introduction to Data Science + STAT4504 Biostatistics

Hello Everyone,

Mathematics and Statistics seeks consultation on two new undergraduate Statistics courses. They are Statistics 1500 (Introduction to Data Science) and Statistics 4504 (Biostatistics). These are new courses in the area of data science that will replace existing courses. In particular, 1500 is a first year course with minimal pre-requisites (high school advanced math is sufficient) and so will be accessible to students in all programs.

If you have a comment or feedback on the attached proposal, I would appreciate receiving it by **November 3rd.**

Best Regards, Ivan Booth (he/him) Deputy Head (Undergraduate) Department of Math and Stats Memorial University

Library Report:

Resource Implications:

Existing Statistics faculty will teach the new course. There will be no additional instructional costs.

The recommended book and the reference books are available online for free.

Additional Information Required for New Course Proposals:

Course Outline

Statistics 1500 - Introduction to Data Science

Course description: Introduction to Data Science aims to teach fundamentals of data science. Emphasis will be placed on data visualization, data wrangling and summarizing data, statistical estimation and testing, regression modeling, supervised and unsupervised statistical learning. Standard data science software will be used to demonstrate the techniques.

Prerequisites: 3 credit hours in Mathematics or Statistics courses, or a combination of placement test and high school Mathematics scores acceptable to the Department

Potential Instructors: Existing Statistics faculty

Textbooks and References:

Recommended text:

 Modern Data Science with R by Benjamin S. Baumer, Daniel T. Kaplan, Nicholas J. Horton, 2nd Edition, Chapman and Hall/CRC, 2021. (Available online: <u>https://mdsr-book.github.io/mdsr2e/</u>)

References:

- R for Data Science: Import, Tidy, Transform, Visualize, and Model Data by Hadley Wickham, Garrett Grolemund, O'Reilly Media, Inc., 2016. (Available online: <u>https://r4ds.had.co.nz</u>)
- Data Science: A First Introduction by Tiffany-Anne Timbers, Trevor Campbell, Melissa Lee, Chapman and Hall/CRC, 2022. (Available online: <u>https://datasciencebook.ca</u>)
- 4. ggplot2: Elegant Graphics for Data Analysis by Hadley Wickham. Springer-Verlag New York, 2009. (Available online: <u>https://ggplot2-book.org/</u>)

Tentative syllabus:

- 1. Data visualization
- 2. Data wrangling and summarizing data
- 3. Statistical estimation and testing
- 4. Regression modeling
- 5. Supervised and unsupervised statistical learning

Evaluation scheme:

Assignments:	20%
Mid-term Exam:	15%
Project:	15%
Final Exam:	50%

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- X New course(s): STAT 4504 Biostatistics
- \Box Amended or deleted course(s):
- \Box New program(s):
- \Box Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council:

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

COURSE NUMBER AND TITLE

STAT 4504 Biostatistics

ABBREVIATED COURSE TITLE

Biostatistics

RATIONALE

Statistics/Biostatistics departments of many North American universities offer a Biostatistics course teaching statistical methodology used in epidemiology. Our aim in the proposed Biostatistics course is to teach statistical designs and methods and computational tools for analysis of complex data in medical and health sciences.

CALENDAR CHANGES under 13.8.2 Statistics Courses

4504 Biostatistics provides an overview of statistical principles and methods in epidemiology. Emphasis will be placed on study designs, measures of risk and diseaseexposure association, inference for measures of association, confounding, causal inference, analysis of binary responses, count, and time-to-event. **PR:** STAT 2550 and STAT 3411

CALENDAR ENTRY AFTER CHANGES under 13.8.2 Statistics Courses

4504 Biostatistics provides an overview of statistical principles and methods in epidemiology. Emphasis will be placed on study designs, measures of risk and disease-exposure association, inference for measures of association, confounding, causal inference, analysis of binary responses, count, and time-to-event.

PR: STAT 2550 and STAT 3411

APPENDIX

Consultations Sought:

Academic Unit	Response Received
Humanities and Social Sciences	
Business Administration	
Education	
Engineering and Applied Science	Yes
Human Kinetics and Recreation	Yes
Marine Institute	
Medicine	
Music	
Nursing	Yes
Pharmacy	Yes
Science	
Biochemistry	
Biology	
Computer Science	
Earth Sciences	

Academic Unit	Response Received
Mathematics and Statistics	
Ocean Sciences	
Physics and Physical Oceanography	
Psychology	
Social Work	
Library	
Grenfell - Arts and Social Science	
Grenfell - Science and the Environment	Yes
Grenfell - Fine Arts	
Labrador Institute	

On 2022-10-24, 13:43, "Engineering Consult" <<u>engrconsult@mun.ca</u>> wrote:

Hi,

Thanks for giving us the opportunity to provide feedback on the calendar change proposal. The Faculty of Engineering and Applied Science Committee on Undergraduate Studies does not anticipate any impact of the proposed changes on engineering programs. Sincerely, Salim Dr. Salim Ahmed, Chair Committee on Undergraduate Studies Faculty of Engineering and Applied Science Memorial University of Newfoundland St. John's NL A1B 3X5

On 2022-10-06 10:53, Booth, Ivan wrote: > Hello Everyone, > >Mathematics and Statistics seeks consultation on two new > undergraduate Statistics courses. They are Statistics 1500 > (Introduction to Data Science) and Statistics 4504 (Biostatistics). > These are new courses in the area of data science that will replace > existing courses. In particular, 1500 is a first year course with > minimal pre-requisites (high school advanced math is sufficient) and > so will be accessible to students in all programs. >>If you have a comment or feedback on the attached proposal, > I would appreciate receiving it by November 3rd. > > Best Regards, >> Ivan Booth (he/him) >> Deputy Head (Undergraduate) > Department of Math and Stats >> Memorial University

From: "Davis,Erin" <<u>emdavis@mun.ca</u>>
Date: Thursday, October 6, 2022 at 14:26
To: Ivan Booth <<u>ibooth@mun.ca</u>>
Subject: FW: Calendar Change Consultation: STAT1500 Introduction to Data Science +
STAT4504 Biostatistics

Hello Ivan,

Thank you for the opportunity to comment on the proposed changes. Pharmacy has no concerns as these changes should not affect our students or programs. Thanks, Erin Erin Davis, PharmD Associate Dean Undergraduate Studies Associate Professor Memorial University School of Pharmacy T 709 864 8815 E <u>emdavis@mun.ca</u>

From: Booth, Ivan [mailto:ibooth@mun.ca]

Sent: Thursday, October 6, 2022 10:53 AM

To: Faculty of Humanities and Social Sciences <<u>hss@mun.ca</u>>; Oldford, Erin <<u>eoldford@mun.ca</u>>; Furey, Edith <<u>efurey@mun.ca</u>>;<u>engrconsult@mun.ca</u>; HKR Dean <<u>hkrdean@mun.ca</u>>; <u>deanofmedicine@med.mun.ca</u>; Karen Bulmer <<u>kbulmer@mun.ca</u>>; DeanNurse <<u>DeanNurse@mun.ca</u>>; <u>pharminfo@mun.ca</u>; Dean of Science <<u>deansci@mun.ca</u>>; adeanugradswk <<u>adeanugradswk@mun.ca</u>>; Library Correspondence <<u>univlib@mun.ca</u>>; <u>kjacobse@grenfell.mun.ca</u>; <u>ssedean@grenfell.mun.ca</u>; <u>thennessey@grenfel</u> <u>l.mun.ca;miugconsultations@mi.mun.ca</u>; Ashlee Cunsolo <<u>ashlee.cunsolo@mun.ca</u>> **Subject:** Calendar Change Consultation: STAT1500 Introduction to Data Science + STAT4504 Biostatistics

Hello Everyone,

Mathematics and Statistics seeks consultation on two new undergraduate Statistics courses. They are Statistics 1500 (Introduction to Data Science) and Statistics 4504 (Biostatistics). These are new courses in the area of data science that will replace existing courses. In particular, 1500 is a first year course with minimal pre-requisites (high school advanced math is sufficient) and so will be accessible to students in all programs.

If you have a comment or feedback on the attached proposal, I would appreciate receiving it by November 3rd.

Best Regards, Ivan Booth (he/him) Deputy Head (Undergraduate) Department of Math and Stats Memorial University

From: "Pike, April" <<u>aprilpike@mun.ca</u>> Date: Saturday, October 8, 2022 at 09:18 To: Ivan Booth <<u>ibooth@mun.ca</u>> Subject: FW: Calendar Change Consultation: STAT1500 Introduction to Data Science + STAT4504 Biostatistics

Good morning

Nursing has no concerns about these two courses, Regards, April

From: DeanNurse <<u>DeanNurse@mun.ca</u>> Sent: Friday, October 7, 2022 12:17 PM **To:** Pike, April <<u>aprilpike@mun.ca</u>> **Subject:** FW: Calendar Change Consultation: STAT1500 Introduction to Data Science + STAT4504 Biostatistics

FYI J

From: Booth, Ivan <<u>ibooth@mun.ca</u>> Sent: Thursday, October 6, 2022 10:53 AM To: Subject: Calendar Change Consultation: STAT1500 Introduction to Data Science + STAT4504 Biostatistics

Hello Everyone,

Mathematics and Statistics seeks consultation on two new undergraduate Statistics courses. They are Statistics 1500 (Introduction to Data Science) and Statistics 4504 (Biostatistics). These are new courses in the area of data science that will replace existing courses. In particular, 1500 is a first year course with minimal pre-requisites (high school advanced math is sufficient) and so will be accessible to students in all programs.

If you have a comment or feedback on the attached proposal, I would appreciate receiving it by November 3rd.

Best Regards, Ivan Booth (he/him) Deputy Head (Undergraduate) Department of Math and Stats Memorial University

From: HKR Dean <<u>hkrdean@mun.ca</u>>
Date: Tuesday, October 18, 2022 at 14:15
To: Ivan Booth <<u>ibooth@mun.ca</u>>
Subject: Re: Calendar Change Consultation: STAT1500 Introduction to Data Science + STAT4504
Biostatistics

Hello Ivan,

Thank you for the opportunity to review. HKR has reviewed and we have no concerns or comments.

Anne-Marie

Anne-Marie Sullivan (she/her), PhD, CTRS Interim Dean, School of Human Kinetics & Recreation Memorial University, St. John's, NL, A1S 5S7 (p) 709-864-8129; (e) <u>hkrdean@mun.ca</u> We acknowledge that the lands on which Memorial University's campuses are situated are in the traditional territories of diverse Indigenous groups, and we acknowledge with respect the diverse histories and cultures of the Beothuk, Mi'kmaq, Innu, and Inuit of this province.

From: "Booth, Ivan" <<u>ibooth@mun.ca</u>>

Date: Thursday, October 6, 2022 at 10:53 AM To: Faculty of Humanities and Social Sciences <<u>hss@mun.ca</u>>, "Oldford, Erin" <<u>eoldford@mun.ca</u>>, "Furey, Edith" <<u>efurey@mun.ca</u>>, "<u>engrconsult@mun.ca</u>" <<u>engrconsult@mun.ca</u>>, HKR Dean <<u>hkrdean@mun.ca</u>>, "<u>deanofmedicine@med.mun.ca</u>" <<u>deanofmedicine@med.mun.ca</u>>, Karen Bulmer <<u>kbulmer@mun.ca</u>>, DeanNurse <<u>DeanNurse@mun.ca</u>>, "<u>pharminfo@mun.ca</u>" <<u>pharminfo@mun.ca</u>>, Dean of Science <<u>deansci@mun.ca</u>>, adeanugradswk <<u>adeanugradswk@mun.ca</u>>, Library Correspondence <<u>univlib@mun.ca</u>>, "<u>kjacobse@grenfell.mun.ca</u>" <<u>kjacobse@grenfell.mun.ca</u>>, "<u>ssedean@grenfell.mun.ca</u>" <<u>ssedean@grenfell.mun.ca</u>>, "<u>thennessey@grenfell.mun.ca</u>" <<u>thennessey@grenfell.mun.ca</u>>, "miugconsultations@mi.mun.ca" <<u>miugconsultations@mi.mun.ca</u>>, Ashlee Cunsolo <<u>ashlee.cunsolo@mun.ca</u>> Subject: Calendar Change Consultation: STAT1500 Introduction to Data Science + STAT4504 Biostatistics

Hello Everyone,

Mathematics and Statistics seeks consultation on two new undergraduate Statistics courses. They are Statistics 1500 (Introduction to Data Science) and Statistics 4504 (Biostatistics). These are new courses in the area of data science that will replace existing courses. In particular, 1500 is a first year course with minimal pre-requisites (high school advanced math is sufficient) and so will be accessible to students in all programs.

If you have a comment or feedback on the attached proposal, I would appreciate receiving it by November 3rd.

Best Regards, Ivan Booth (he/him) Deputy Head (Undergraduate) Department of Math and Stats Memorial University

From: "Sveshnikov, Dmitry" <<u>dmitry.sveshnikov@grenfell.mun.ca</u>>
Date: Friday, November 4, 2022 at 13:15
To: Ivan Booth <<u>ibooth@mun.ca</u>>
Cc: Dean - School of Science and the Environment <<u>ssedean@grenfell.mun.ca</u>>
Subject: RE: Calendar Change Consultation: STAT1500 Introduction to Data Science + STAT4504 Biostatistics

Dear Professor Booth, A slightly late (but positive) note:

The SSE Committee on Academic Programming has reviewed the materials for the following calendar change proposal:

• Statistics 1500 (Introduction to Data Science) and Statistics 4504 (Biostatistics).

The Committee has no concerns, and we have not heard any from the potentially interested programs. As a personal note, should such courses be offered online/remotely, we'll be happy to advertise them to our students at Grenfell.

Thank you,

Dmitry Sveshnikov (Chair of SSE-CAP)

Dmitry Sveshnikov, Assoc. Professor Environmental Science / Biology School of Science and the Environment Grenfell Campus Memorial University of Newfoundland 20 University Drive, Corner Brook Newfoundland, Canada, A2H 5G4

Office: AS213 Phone: +1(709)639-6528 (leave a message) Email: <u>dmitry.sveshnikov@grenfell.mun.ca</u>

From: Booth, Ivan <<u>ibooth@mun.ca</u>>

Sent: October 6, 2022 10:53 AM

To: Faculty of Humanities and Social Sciences <<u>hss@mun.ca</u>>; Oldford, Erin <<u>eoldford@mun.ca</u>>; Furey, Edith <<u>efurey@mun.ca</u>>;<u>engrconsult@mun.ca</u>; HKR Dean <<u>hkrdean@mun.ca</u>>; <u>deanofmedicine@med.mun.ca</u>; Karen Bulmer <<u>kbulmer@mun.ca</u>>; DeanNurse <<u>DeanNurse@mun.ca</u>>; <u>pharminfo@mun.ca</u>; Dean of Science <<u>deansci@mun.ca</u>>; adeanugradswk <<u>adeanugradswk@mun.ca</u>>; Library Correspondence <<u>univlib@mun.ca</u>>; Jacobsen, Ken <<u>kjacobse@grenfell.mun.ca</u>>; Dean - School of Science and the Environment <<u>ssedean@grenfell.mun.ca</u>>; Hennessey, Todd

<<u>THENNESSEY@grenfell.mun.ca</u>>; <u>miugconsultations@mi.mun.ca</u>; Ashlee Cunsolo <<u>ashlee.cunsolo@mun.ca</u>>

Subject: Calendar Change Consultation: STAT1500 Introduction to Data Science + STAT4504 Biostatistics

Hello Everyone,

Paper 5.A.j. (pages 63-73)

Mathematics and Statistics seeks consultation on two new undergraduate Statistics courses. They are Statistics 1500 (Introduction to Data Science) and Statistics 4504 (Biostatistics). These are new courses in the area of data science that will replace existing courses. In particular, 1500 is a first year course with minimal pre-requisites (high school advanced math is sufficient) and so will be accessible to students in all programs.

If you have a comment or feedback on the attached proposal, I would appreciate receiving it by **November 3rd.**

Best Regards, Ivan Booth (he/him) Deputy Head (Undergraduate) Department of Math and Stats Memorial University

Library Report: Resource Implications:

Existing Statistics faculty will teach the new course. There will be no additional instructional costs.

Additional Information Required for New Course Proposals: Course Outline:

Statistics 4504 - Biostatistics

Course Description: Statistics 4504 provides an overview of statistical principles and methods in epidemiology. Emphasis will be placed on study designs, measures of risk and disease-exposure association, inference for measures of association, confounding, causal inference, analysis of binary responses, count, and time-to-event.

Prerequisites: Statistics 2550, Statistics 3411

Textbooks:

- 1. N. P. Jewell. Statistics for Epidemiology. Chapman & Hall, 2004.
- 2. S. C. Newman. Biostatistical Methods in Epidemiology. Wiley, 2001.
- 3. M. A. Hernan, J. M. Robins. Causal Inference: What If. Boca Raton: Chapman & Hall/CRC, 2020.
- 4. J. F. Lawless. Statistical Models and Methods for Lifetime Data, 2nd Edition. John Wiley and Sons, New York, 2003.

Potential Instructors: Yildiz Yilmaz, Candemir Cigsar
Tentative Syllabus:

- 1. Statistics in Medicine and Public Health
- 2. Study Designs
- 3. Measures of Risk and Association
- 4. Randomization and Causation
- 5. Analysis of Binary Responses and Counts
- 6. Case-Control Studies
- 7. Randomized Clinical Trials
- 8. Causal Inference
- 9. Survival Analysis

Evaluation Scheme:

Assignments:	10%
Midterm exam:	20%
Final exam:	50%
Project:	20%

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page for Changes to M2260

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- \Box New course(s):
- X Amended or deleted course(s):
- \Box New program(s):
- \Box Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council: _____

COURSE NUMBER AND TITLE

M2260 Ordinary Differential Equations I

RATIONALE

Executive Summary: The current version of this course was developed more than 30 years ago and we feel that it is time for an update. With the recognition that this is the only course that many students will take in differential equations (apart from the short introduction that now happens in M1001), M2260 is updated to ensure that all commonly used types of ordinary differential equations (first order, second order and systems of first order) are studied in some detail. Students will also be introduced to computer algebra software which makes it possible to study a much wider range of of problems than usually covered in a first courses. They will come away from the new M2260 well-equipped to work with the ordinary differential equations that they may encounter in their future studies.

Longer Overview: For most students, M2260 will be the only course that they take in differential equations (DEs). Hence this introductory course should cover all the core topics needed by both Math and other majors. These are: 1st order ordinary differential equations (basic understanding), 2nd order ordinary differential equations (for physical applications) and systems of 1st order differential equations (for biological applications). It should also introduce the necessary tools to allow students to easily study these types of equations. In the current day, this includes computer algebra systems.

Apart from a renumbering from 3260 to 2260, this course is essentially unchanged since (at least) the early 1990s. While the basic principles of differential equations have certainly not changed in that time, the tools available for studying them have evolved very significantly. In particular, computer algebra systems are now both powerful and easy to use. These tools make it almost trivial to do things like plotting direction fields or the solutions to differential equations. All of the exact solution techniques taught in 2260 can be automatically recognized and implemented by these systems. Further there are single commands that can generate numerical solutions to initial value problems without the need to understand the details of the methods.

We feel that the utility of these tools means that they should be taught as part of this course. Not only will they allow students to consider more interesting examples and better explore the mathematics but also they will be tools that will remain useful for those students in future course both inside and outside of our Department.

Currently we are piloting computer algebra in M2000 (the pre-req to 2260). There, we are using computer algebra for basic arithmetic and algebra, plotting curves and surfaces, taking derivatives, calculating integrals and calculations with power series. Assuming that those changes are formalized, 2260 will be students' second serious encounter with computer algebra and so it will be relatively straightforward to add in new techniques.

There will two significant groups of material added to M2260:

- <u>Computer algebra</u>: Over the length of the course, about 4 classes of material will be added to teach how to use computers to explore topics that would otherwise be inaccessible. We will use Sagemath which is free, open-source and Pythonbased while at the same time making it very easy to solve differential equations both exactly and numerically and study those solutions. Apart from specific classes teaching techniques, Sagemath would also be used in other lectures and there will be questions using it on the assignments. The impact will be greather than just the four classes.
- 2) <u>Systems of 1st DEs</u>: Currently these are only very briefly introduced over two or three classes at the end of the semester. We propose adding 6 classes of material to make it possible to reach the classification of fixed points for pairs of coupled linear DEs and briefly touch on the non-linear case. With access to computer algebra it will be possible to study many interesting systems, including population and disease models.

Necessarily there will also be some material removed:

- <u>3rd and higher order linear DEs</u>: Removing these saves about 3 classes. They are very rare in application and their theory is essentially the same as second order linear DEs. For a first course they are not a core topic.
- 2) <u>Laplace transforms:</u> These would be reduced by about 4 classes (from the current 7 to about 3). While they are theoretically important and have some applications, we feel that just covering the basics is sufficient for a first course. 30 years ago they were, perhaps, more important in applications. But easy access to computers means that they are no longer the easiest way to find exact solutions for really any problem.
- 3) Lesser used exact solution techniques for 1st order DEs: Core techniques are important for understanding, but the lesser used tricks (for example the technique for Bernoulli equations) will likely not be remembered beyond the exam. Cutting back on these will save 1 class.
- 4) <u>Time savings from M1001</u>: Starting this year students are getting an introduction to DEs in M1001 which includes separable DEs. By Fall 2023 this cohort of students will start arriving in M2260. This should save 2 classes in 2260.

More details on the changes and rationale can be found in the appendix. All standard texts cover all the topics and so there is no issue with material not being covered. Modern text usually include computer algebra/numerical exercises.

CALENDAR CHANGES

2260 Ordinary Differential Equations I examines direction fields, equations of first order and first degree, higher order linear equations, variation of parameters, methods of undetermined coefficients, Laplace transforms, systems of differential equations. Applications include vibratory motion, satellite and rocket motion, pursuit problems,

Paper 5.A.k. (pages 74-86)

population models and chemical kinetics. introduces first and second order differential equations, systems of first order differential equations and Laplace transforms. These will be studied with both analytic techniques as well as using a computer algebra system to generate symbolic and numerical solutions. Applications include oscillatory motion and population and epidemic models.

CR: the former MATH 3260 **PR**: MATH 2000

CALENDAR ENTRY AFTER CHANGES

2260 Ordinary Differential Equations I introduces first and second order differential equations, systems of first order differential equations and Laplace transforms. These will be studied with both analytic techniques as well as using a computer algebra system to generate symbolic and numerical solutions. Applications include oscillatory motion and population and epidemic models.

CR: the former MATH 3260 **PR**: MATH 2000

Appendix for Changes to M2260

CONSULTATIONS SOUGHT

A request for consultations was sent out on Oct 27 asking for responses by Nov 24. Four responses were received.

Academic Unit	Response Received
Humanities and Social Sciences	
Business Administration	
Education	
Engineering and Applied Science	Yes
Human Kinetics and Recreation	
Marine Institute	
Medicine	
Music	Yes
Nursing	
Pharmacy	Yes
Science	
Biochemistry	
Biology	
Computer Science	
Earth Sciences	
Mathematics and Statistics	

Academic Unit	Response Received
Ocean Sciences	
Physics and Physical Oceanography	
Psychology	
Social Work	
Library	
Grenfell - Arts and Social Science	
Grenfell - Science and the Environment	Yes
Grenfell - Fine Arts	
Labrador Institute	

ENGINEERING (Nov 23, 2022)

Hi,

Thanks for giving us the opportunity to provide feedback on the proposed calendar changes. The proposed changes are relevant, however, the Faculty of Engineering and Applied Science Committee on Undergraduate Studies does not anticipate any impact of the proposed changes on engineering programs. Sincerely,

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

On 2022-10-27 09:33, Booth, Ivan wrote: > Hello Everyone,

> Mathematics and Statistics seeks consultation on an update

- > to our first course in differential equations: M2260. The full
- > proposed calendar change is attached but, for convenience, it is also
- > briefly summarized below.
- >

GRENFELL (Nov 16, 2022)

Hello,

The math unit in the School of Science & the Environment at Grenfell Campus has no concerns about the proposed changes to Math 2260 on the St. John' campus. For now, we do not want to follow the new calendar description, and so we expect to propose our own ODE course in the near future. We can keep the old description in the Grenfell Campus of the calendar until then.

Rebecca

Rebecca Milley, PhD

Chair, Computational Mathematics Grenfell Campus, Memorial University of Newfoundland Corner Brook, NL, Canada (709) 639-2596 AS 3011

MUSIC (Oct 27, 2022)

Dear Ivan, Thank you for the opportunity to review this course update. Music has no substantive feedback. Best wishes, Michelle

Michelle Cheramy, DMA (she/her) Acting Associate Dean (academic), School of Music Memorial University of Newfoundland St. John's, NL, Canada <u>mcheramy@mun.ca</u>

From: "Booth, Ivan" <<u>ibooth@mun.ca</u>>

Date: Thursday, October 27, 2022 at 9:33 AM

To: Faculty of Humanities and Social Sciences <<u>hss@mun.ca</u>>, "Oldford, Erin" <<u>eoldford@mun.ca</u>>, "Furey, Edith" <<u>efurey@mun.ca</u>>, "<u>engrconsult@mun.ca</u>" <<u>engrconsult@mun.ca</u>>, HKR Dean <<u>hkrdean@mun.ca</u>>, "<u>deanofmedicine@med.mun.ca</u>" <<u>deanofmedicine@med.mun.ca</u>>, Karen Bulmer <<u>kbulmer@mun.ca</u>>, DeanNurse <<u>DeanNurse@mun.ca</u>>, "<u>pharminfo@mun.ca</u>" <<u>pharminfo@mun.ca</u>>, Dean of Science <<u>deansci@mun.ca</u>>, adeanugradswk <<u>adeanugradswk@mun.ca</u>>, Library Correspondence <<u>univlib@mun.ca</u>>, "<u>kjacobse@grenfell.mun.ca</u>" <<u>kjacobse@grenfell.mun.ca</u>>, "ssedean@grenfell.mun.ca" <<u>ssedean@grenfell.mun.ca</u>, "thennessey@grenfell.mun.ca" <<u>thennessey@grenfell.mun.ca</u>>, "<u>miugconsultations@mi.mun.ca</u>" <<u>miugconsultations@mi.mun.ca</u>>, Ashlee Cunsolo <<u>ashlee.cunsolo@mun.ca</u>> **Subject:** Calendar Change Consultation: MATH 2260 Differential Equations I

Hello Everyone,

Mathematics and Statistics seeks consultation on an update to our first course in differential equations: M2260. The full proposed calendar change is attached but, for convenience, it is also briefly summarized below.

PHARMACY (Oct 27, 2022)

Hi Ivan,

Thank you for the opportunity to comment on the proposed changes. We have no concerns and do not believe these changes will affect pharmacy students or programs.

Erin

Erin Davis, BSc(Pharm), PharmD

Associate Professor | School of Pharmacy Associate Dean, Undergraduate | School of Pharmacy Chair, Committee on Undergraduate Studies | School of Pharmacy Clinical Assistant Professor | Faculty of Medicine, Discipline of Family Medicine

Memorial University of Newfoundland and Labrador School of Pharmacy Health Sciences Centre 300 Prince Phillip Dr. | Rm H3443 St. John's NL | A1B 3V6

T 709 864 8815 | F 709 864 6941

From: "Bugler, Heather" <<u>hbugler@mun.ca</u>>
Date: Thursday, October 27, 2022 at 9:39 AM
To: "Davis,Erin" <<u>emdavis@mun.ca</u>>, "Ho, Cam Thi Hong" <<u>chongh@mun.ca</u>>
Subject: FW: Calendar Change Consultation: MATH 2260 Differential Equations I

Heather

Heather Bugler Assistant to the Dean School of Pharmacy Memorial University of Newfoundland Room 3441, Health Sciences Centre 300 Prince Philip Parkway St. John's, NL A1B 3V6 Tele: 709-864-4599 Fax: 709-864-4819

LIBRARY REPORT

A report was sought on November 3 but we haven't heard back yet.

Hello Library,

This is a change of course description to M2260 (intro ordinary differential equations), so my understanding is that we need to do a library consult. Note that though the course description changes, we will still be using the same textbook – just covering slightly different sections. These are all standard topics covered in almost differential equation text. So in our judgement it will not require any changes in library holdings. However I think that by the letter of the rules this is required.

Best Regards, Ivan Booth (he/him) Deputy Head (Undergraduate) Department of Math and Stats Memorial University

From: Ivan Booth <<u>ibooth@mun.ca</u>> Date: Thursday, October 27, 2022 at 09:33 To: Faculty of Humanities and Social Sciences <<u>hss@mun.ca</u>>, "Oldford, Erin" <<u>eoldford@mun.ca</u>>, "Furey, Edith" <<u>efurey@mun.ca</u>>, "<u>engrconsult@mun.ca</u>" <<u>engrconsult@mun.ca</u>>, HKR Dean <<u>hkrdean@mun.ca</u>>, "<u>deanofmedicine@med.mun.ca</u>" <<u>deanofmedicine@med.mun.ca</u>>, Karen Bulmer <<u>kbulmer@mun.ca</u>>, DeanNurse <<u>DeanNurse@mun.ca</u>>, "pharminfo@mun.ca" <<u>pharminfo@mun.ca</u>>, Dean of Science <<u>deansci@mun.ca</u>>, adeanugradswk <<u>adeanugradswk@mun.ca</u>>, Library Correspondence <<u>univlib@mun.ca</u>>, "<u>kjacobse@grenfell.mun.ca</u>" <<u>kjacobse@grenfell.mun.ca</u>>, "<u>ssedean@grenfell.mun.ca</u>", <u>"miugconsultation</u>s@mi.mun.ca" <<u>thennessey@grenfell.mun.ca</u>>, <u>"miugconsultation</u>s@mi.mun.ca" Subject: Calendar Change Consultation: MATH 2260 Differential Equations I Hello Everyone,

Mathematics and Statistics seeks consultation on an update to our first course in differential equations: M2260. The full proposed calendar change is attached but, for convenience, it is also briefly summarized below.

RESOURCE IMPLICATIONS

This is an update of an existing course. There are no resource implications.

ADDITIONAL INFORMATION

Extra Course Details

Mathematics 2260 – Ordinary Differential Equations I

Course Description: Ordinary Differential Equations I I introduces first and second order differential equations, systems of first order differential equations and Laplace transforms. These will be studied with both analytic techniques as well as using a computer algebra system to generate symbolic and numerical solutions. Applications include oscillatory motion and population and epidemic models.

Prerequisites: Mathematics 2000 **Credit Restriction**: the former Mathematics 3260.

Potential Instructors: Any mathematics faculty member (the current version is taught by many different people at different times).

Textbooks and References: Possible text books include:

- 1. Elementary Differential Equations and Boundary Value Problems by William E. Boyce, Richard C. Diprima and Douglas B. Meade, 11th Edition, Wiley 2017.
- 2. Differential Equations: an Introduction to Modern Methods and Applications by James R. Brennan and William E. Boyce, 3rd Edition, Wiley 2015.

However, like calculus, all differential equations texts cover pretty much the same material. Any text will do including many that are freely available online. In recent years we have not been requiring students to buy a textbook.

Evaluation Scheme: A typical mark distribution would be:

a) Problem sets: 0%
b) Assignments: 25%
c) Midterm: 25%
d) Final Exam: 50%

In Fall 2021 when some of these ideas were piloted, the problem sets were more routine problems (there were 7 of these) while the Assignments were deeper (just 5 of these) and often included using computer algebra.

Schedule/Comparison with Traditional Offering

Below is a detailed head-to-head comparison of the distribution of lectures for a traditional offering of the course versus the revised version. The traditional lectures are from Ivan Booth's 2018 offering of the course while the revised is based on his Fall 2021 offering when he piloted the changes (though using Maple instead of Sagemath), though modified in anticipation of the changes in M1001 and M2000.

NOTE: This is just provided to give a rough idea of course layout. It is not intended to be prescriptive. Each instructor will distribute their lectures slightly differently.

Section	Traditional Lectures (34)	Proposed Revised Lectures (34)
Intro / Day 1	1	1
Introduction		
1.1 Basic mathematical	1	1
models; direction fields		
1.2 Solutions to some DEs	0.5	0.5
1.3 Classification of DEs	0.5	0.5
Intro to DEs with Sage	0	2 (for example SIR-type epidemic models)
including numerical		
solutions		
Subtotal	3	5
First Order Equations		
2.1 Linear equations:	2	2
integrating factors		
2.2 Separable DEs	2	0.5 (just need to review from M1001)
2.3 Existence and uniqueness	1	1
2.4 Applications: population	1	1
dynamics		
2.5 Exact equations	1.5	1.5
2.6 Other substitutions and	1.5	0.5 Maybe review but don't test the
transformations		specialized ones – those cases can be solved
		with computer algebra.
Using Sage for 1 st order	0	1
problems	2	
Subtotal	9	7.5
Second Order Equations		
3.1 Existence and uniqueness	2	2
and general properties		
3.2 Constant coefficients and	2	2
second solutions		
3.3 Undetermined	2	2
coefficients	-	
3.4 Variation of parameters	2	1.5 (don't test most algebraically complicated
	2	cases)
3.5 Application: oscillations	2	2
Using Sage for 2 nd order ODEs	0	1

Subtotal	10	10.5
Higher order ODEs		
4.1 Existence and uniqueness	1	0
and general properties		
4.2 Solution techniques	2	0
Subtotal	3	0
Laplace Transforms		
5.1 Definitions and	2	1
foundations		
5.2 Basic Theory	1	1
5.3 Inverse Laplace	2	1
Transforms and IVPs		
5.4 Step and impulse	1	0
functions		
5.5 Convolutions	1	0
Subtotal	7	3
Systems of 1 st -Order DEs		
6.1 Introduction + existence	1	1
and uniqueness		
6.2 Basic theory of systems	1	2.5 (include transforming from 2 nd order to
of 1 ^{st-} order linear equations		system of first order)
6.3 Homogenous linear	0	2.5
systems with constant		
coefficients		
6.4 Non-linear equilibrium	0	2
points		
Subtotal	2	8

Colours: green: added in, light red: reduced emphasis, dark red: removed,

blue: moved, white: unchanged remains in, grey: unchanged remains out

Comparison with offerings at other Canadian universities

Below is a comparison of equivalent offerings at several Canadian universities. This necessarily biased towards those universities/instructors that provide sufficient information online.

Often 2nd order odes aren't mentioned but higher order ones are. However, in those cases most examples seem to be 2nd order and the techniques are the usual ones (constant coefficient linear, undetermined coefficients, variations of parameters). So probably this is really almost all second order with a few token higher order ones like we do.

Topic	UofT	Dal	UNB	UVic	UBC	Mt	U	Guelph	Ottawa	Carleton	MUN
			*	**		Royal	Calg				(old)
1 st order	Х	Х	Х	Х	Х	Х	Х	X (12)	Х	Х	Х
ODEs							(7)				(12)
2 nd order	Х	Х	Х	Х	Х	Х					X (9)
ODEs											
Higher	Х	Х					Х	X (10)	Х	Х	X (3)
Order							(7)			(linear)	
ODEs											
Systems 1 st	Х	Х	Х		Х	Х	Х	X (3)	Х	Х	X (3)
order							(6)				
linear											
ODEs											
Systems 1 st	Х	X	Х		Х				?	Х	
order non-											
linear											
ODES								TT (6)			TT (D)
Laplace		X	Х		Х	X	X	X (6)	Х		X (7)
Iransforms				37			(9)	X7.(0)			
Fourier				Х				X (2)			
Series							(8) !				
Series	X		Х	X		X		X (3)	Х	Х	
solutions/											
special											
functions											
Vector				X							
Calculus!				!							

Note that most universities seem to cover more than we do.

Parentheses indicate approximate number of lectures spent on a topic when I can find a good syllabus. *For UNB some 1st order, 2nd order and power series may have already been seen in another course.

** This is a weird one. UVic M204, Calculus 4 also seems to include vector fields, div/grad/curl and divergence and Stokes theorem.

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- \Box New course(s):
- \Box Amended or deleted course(s):
- □ New program(s):
- **X** Amended or deleted program(s):
 - 11.11. 2. Admission to Major Programs
 - 11.11. 4. Requirements for a Major in Psychology
 - 11.11. 6. Requirements for a Major in Behavioural Neuroscience (B.Sc. Only)
- New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council:

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Programs

PROGRAM TITLE

11.11. PSYCHOLOGY:

- 11.11. 2. Admission to Major Programs
- 11.11. 4. Requirements for a Major in Psychology
- 11.11. 6. Requirements for a Major in Behavioural Neuroscience (B.Sc. Only)

RATIONALE

These proposed changes are contingent on the Senate approval of the Statistics 1500 course proposed by the Department of Mathematics and Statistics for the 2023-24 Calendar year.

Firstly, the Psychology Department strongly endorses both the proposed Statistics 1500 course. We feel that Statistics 1500 would prepare our future majors in Psychology and Behavioural Neuroscience well for the statistics and research design courses that they are required to complete in the program - specifically, Psychology 2910, 2911, and 3900 (Honours students only).

Given that the requirements for entrance into Statistics 1500 are similar to those for Math 1000 (or equivalent), we propose to amend the current admission regulations, as well as the requirements for the major in Psychology and the major in Behavioural Neuroscience to include this course as an alternative to Math 1000 (or equivalent).

Some students will require Math 1000 (or equivalent) as a pre-requisite for other courses that they plan to take- particularly in the case of our students who plan to complete various Joint Honours programs. We will continue to advise students to take Math 1000 in such cases, and encourage them to also consider taking Stat 1500 as an elective. A note has been added to 11.11.2. to reflect this.

The wording "(or equivalent)" has been added to the mentions of Mathematics 1000 throughout the regulations, as our students have been able to meet the degree requirements in 11.11.4 and 11.11.6. by completing the two Mathematics courses that are alternatives to Mathematics 1000 (or equivalent) that are required for admission (as specified in regulation 11.11.2). We also have specified these courses, as the specific wording did not appear in 11.11.4. or 11.11.6. It is now added for clarity.

Finally, during consultations last year regarding Psychology program changes, Dr. Robert Bailey at Grenfell campus offered some suggestions regarding the courses that might be listed and excluded in 11.11.7. Requirements for a Major in Behavioural Neuroscience, clause 3 – "Eighteen credit hours from the following courses chosen from at least two different sciences". These are to reflect changes in pre-requisites for 3000 level Mathematics courses (recommendation to remove the listing of two 3000-level courses that would be challenging for non-Math majors, and add two pre-requisite 2000-level Mathematics courses that students would need for some courses at the 3000-level and beyond). In addition, he recommended adding Grenfell's recent course Physics 2150 as an exclusion to the list of courses that can be taken in Physics, as it is a general-interest course, similar to another already-excluded course, Physics 2151. These changes have been added to 11.11.7. 3 (f) and 11.11.7. 3. (h).

CALENDAR CHANGES

11.11.2 Admission to Major Programs

Admission to the Major programs in the Department of Psychology is competitive and selective. Students who wish to enter these programs must submit a completed application form, available on the Department of Psychology website in the Winter semester, to the Department of Psychology by June 1 for Fall semester registration. To be eligible for admission, students must have completed the 24 credit hours as listed below with an average of at least 65% in Psychology 1000/1001 and an overall average of at least 60% in Psychology, Critical Reading and Writing (CRW), and Mathematics or Statistics:

- 1. Psychology 1000, 1001.
- 2. Six credit hours in Critical Reading and Writing (CRW) courses, including at least 3 credit hours in English courses.
- 3. Mathematics 1000 (or equivalent) or Statistics 1500, or two of Mathematics 1090, 1050, 1051 (or equivalent).
- 4. Six credit hours of electives (9 if only Mathematics 1000 or Statistics 1500 is successfully completed).

Students who fulfil the eligibility requirements compete for a limited number of available spaces. Selection is based on academic performance, normally cumulative average and performance in recent courses.

Note: Students should consult the Calendar course descriptions to determine whether Mathematics 1000 (or equivalent) is a pre-requisite for other (non-Psychology) courses they plan to take. In particular, students considering Joint Majors or Joint Honours programs should consider taking both Mathematics 1000 (or equivalent) and Statistics 1500.

11.11.4 Requirements for a Major in Psychology

Students completing this program cannot receive credit for Psychology 2920. Students who intend to pursue graduate studies should take courses leading to the Honours degree.

- Students may Major in Psychology as part of either a B.A. or a B.Sc. program, and should consult the **Degree Regulations** for the General Degree of Bachelor of Science or the **Degree Regulations** for the General Degree of Bachelor of Arts, as appropriate. All Majors are required to complete a minimum of 42 credit hours of Psychology as listed below:
 - a. Psychology 1000, 1001, 2520 (or 2521), 2910, 2911, 2930.
 - Twelve credit hours in Psychology chosen from the following: 3050, 3100, the former PSYC 3250, 3251, 3350, 3450, 3620, 3650, 3750, or one of 3800, 3810, 3820, 3830, 3840 or 3860.
 - c. Twelve credit hours of 4000-level courses in Psychology, of which at least one must be a research experience course and one must be a selected topics course.
- 2. Psychology Majors following the B.Sc. program are also required to successfully complete the following:

a. Mathematics 1000 (or equivalent) <u>or Statistics 1500</u>, <u>or two of Mathematics</u> 1090, 1050, 1051 (or equivalent).

- b. Biology 1001 and 1002.
- c. Either Chemistry 1050 and 1051 (or 1200 and 1001 or 1010 and the former 1011); or Physics 1020 (or 1050) and 1021 (or 1051).

Note:

First year students should think carefully about whether Chemistry or Physics best suits their future program needs. Students should examine the prerequisites for upper-level science courses and attempt to take them in their first year.

 d. Six credit hours of laboratory courses at the 2000 level or above in one of Biochemistry, Biology, Chemistry, Computer Science, Ocean Sciences or Physics. Students are advised to consult the **Course Descriptions** section of the Calendar for their chosen lab courses to ensure pre-requisites are met.

Note:

Biology/Psychology 3750 and 4701 and Biology 3053 cannot be used to satisfy the requirement of 6 laboratory credit hours at the 2000 level or above.

3. Psychology Majors following the B.A. program are also required to successfully complete Mathematics 1000 (or equivalent), or Statistics 1500, or two of <u>Mathematics</u> 1090, 1050, 1051 (or equivalent), and are encouraged to complete at least 6 credit hours in Biology.

11.11.7 Requirements for Honours in Behavioural Neuroscience (B.Sc. Only)

Students completing this program cannot receive credit for Psychology 2920. A program is offered in the Psychology Department to provide an education in Behavioural Neuroscience. Students planning to enroll in the program are advised to consult with the Head of the Department at the earliest opportunity because certain course choices may restrict later options. Students who intend to pursue graduate studies should take courses leading to the Honours degree.

As a component of the **Degree Regulations** for the General Degree of Bachelor of Science, the program for a Major in Behavioural Neuroscience shall include:

- 1.
- a. Psychology 1000, 1001, 2521, 2910, 2911, 2930, 3800, 3820, and one of 3810, 3830, 3840, or 3860.
- b. Three credit hours in Psychology chosen from the following: 3050, 3100, the former 3250, 3251, 3350, 3450, 3620, 3650, 3750.
- c. Any research experience course and one of Psychology 4250, 4251, 4850, 4851, 4852, 4853, or 4854; or, any selected topics course and Psychology 4870.
- 2.
- a. Mathematics 1000 (or equivalent), <u>or Statistics 1500</u>, <u>or two</u> <u>of Mathematics 1090, 1050, 1051 (or equivalent)</u>.
- b. Chemistry 1050 and 1051 (or 1200 and 1001).
- c. Physics 1020 (or 1050) and 1021 (or 1051).
- d. Biology 1001 and 1002.
- e. Six credit hours in **Critical Reading and Writing (CRW)** courses, including at least 3 credit hours in English courses.
- 3. Eighteen credit hours from the following courses chosen from at least two different sciences:
 - a. Biochemistry: Any 2000-, 3000-, or 4000-level course except the former 2000, 2005, the former 2010, the former 2011, 3202, 3402, or 4502.
 - b. Biology: Any 2000-, 3000-, or 4000-level course except 2040, 2041, 2120, 3053, or 3820.
 - c. Chemistry: 2100, 2210, 2301 (or the former Chemistry 2300), 2302, 2400, 2401, 2610, or any 3000 or 4000 level course.
 - d. Computer Science: Any 2000, 3000, or 4000 level course except the former 2650 and the former 2801.
 - e. Ocean Sciences: any 2000-, 3000-, or 4000-level course.
 - f. Mathematics: 2000, 2050, 2051<u>, 2260, 2320</u>, 3000, 3001 or any 3000 or 4000 level mathematics course.
 - g. Medicine 310A/B.
 - h. Physics: Any 2000, 3000, or 4000 level course except <u>2150</u>, 2151, 3150, 3151.

Notes:

1. Credit may not be obtained for both Biology 3750 and Psychology 3750 or for both Biology 4701 and Psychology 4701.

2. The courses listed under Clause 3 may have prerequisites. It is the student's responsibility to ensure that all prerequisites have been met, or that waivers have been obtained, before registering for these courses.

CALENDAR ENTRY AFTER CHANGES

11.11.2 Admission to Major Programs

Admission to the Major programs in the Department of Psychology is competitive and selective. Students who wish to enter these programs must submit a completed application form, available on the Department of Psychology website in the Winter semester, to the Department of Psychology by June 1 for Fall semester registration. To be eligible for admission, students must have completed the 24 credit hours as listed below with an average of at least 65% in Psychology 1000/1001 and an overall average of at least 60% in Psychology, Critical Reading and Writing (CRW), and Mathematics or Statistics:

- 5. Psychology 1000, 1001.
- 6. Six credit hours in Critical Reading and Writing (CRW) courses, including at least 3 credit hours in English courses.
- 7. Mathematics 1000 (or equivalent) or Statistics 1500, or two of Mathematics 1090, 1050, 1051 (or equivalent).
- 8. Six credit hours of electives (9 if only Mathematics 1000 or Statistics 1500 is successfully completed).

Students who fulfil the eligibility requirements compete for a limited number of available spaces. Selection is based on academic performance, normally cumulative average and performance in recent courses.

Note: Students should consult the Calendar course descriptions to determine whether Mathematics 1000 (or equivalent) is a pre-requisite for other (non-Psychology) courses they plan to take. In particular, students considering Joint Majors or Joint Honours programs should consider taking both Mathematics 1000 (or equivalent) and Statistics 1500.

11.11.4 Requirements for a Major in Psychology

Students completing this program cannot receive credit for Psychology 2920. Students who intend to pursue graduate studies should take courses leading to the Honours degree.

4. Students may Major in Psychology as part of either a B.A. or a B.Sc. program, and should consult the **Degree Regulations** for the General Degree of Bachelor of Science or the **Degree Regulations** for the General Degree of Bachelor of

Arts, as appropriate. All Majors are required to complete a minimum of 42 credit hours of Psychology as listed below:

- a. Psychology 1000, 1001, 2520 (or 2521), 2910, 2911, 2930.
- Twelve credit hours in Psychology chosen from the following: 3050, 3100, the former PSYC 3250, 3251, 3350, 3450, 3620, 3650, 3750, or one of 3800, 3810, 3820, 3830, 3840 or 3860.
- c. Twelve credit hours of 4000-level courses in Psychology, of which at least one must be a research experience course and one must be a selected topics course.
- 5. Psychology Majors following the B.Sc. program are also required to successfully complete the following:

a. Mathematics 1000 (or equivalent) or Statistics 1500, or two of Mathematics 1090, 1050, 1051 (or equivalent).

- e. Biology 1001 and 1002.
- f. Either Chemistry 1050 and 1051 (or 1200 and 1001 or 1010 and the former 1011); or Physics 1020 (or 1050) and 1021 (or 1051).

Note:

First year students should think carefully about whether Chemistry or Physics best suits their future program needs. Students should examine the prerequisites for upper-level science courses and attempt to take them in their first year.

g. Six credit hours of laboratory courses at the 2000 level or above in one of Biochemistry, Biology, Chemistry, Computer Science, Ocean Sciences or Physics. Students are advised to consult the **Course Descriptions** section of the Calendar for their chosen lab courses to ensure pre-requisites are met.

Note:

Biology/Psychology 3750 and 4701 and Biology 3053 cannot be used to satisfy the requirement of 6 laboratory credit hours at the 2000 level or above.

6. Psychology Majors following the B.A. program are also required to successfully complete Mathematics 1000 (or equivalent), or Statistics 1500, or two of Mathematics 1090, 1050, 1051 (or equivalent), and are encouraged to complete at least 6 credit hours in Biology.

11.11.7 Requirements for Honours in Behavioural Neuroscience (B.Sc. Only)

Students completing this program cannot receive credit for Psychology 2920. A program is offered in the Psychology Department to provide an education in Behavioural Neuroscience. Students planning to enroll in the program are advised to consult with the Head of the Department at the earliest opportunity because certain course choices may restrict later options. Students who intend to pursue graduate studies should take courses leading to the Honours degree. As a component of the **Degree Regulations** for the General Degree of Bachelor of Science, the program for a Major in Behavioural Neuroscience shall include:

- 4.
- a. Psychology 1000, 1001, 2521, 2910, 2911, 2930, 3800, 3820, and one of 3810, 3830, 3840, or 3860.
- b. Three credit hours in Psychology chosen from the following: 3050, 3100, the former 3250, 3251, 3350, 3450, 3620, 3650, 3750.
- c. Any research experience course and one of Psychology 4250, 4251, 4850, 4851, 4852, 4853, or 4854; or, any selected topics course and Psychology 4870.
- 5.
- a. Mathematics 1000 (or equivalent), or Statistics 1500, or two of Mathematics 1090, 1050, 1051 (or equivalent).
- b. Chemistry 1050 and 1051 (or 1200 and 1001).
- c. Physics 1020 (or 1050) and 1021 (or 1051).
- d. Biology 1001 and 1002.
- e. Six credit hours in **Critical Reading and Writing (CRW)** courses, including at least 3 credit hours in English courses.
- 6. Eighteen credit hours from the following courses chosen from at least two different sciences:
 - a. Biochemistry: Any 2000-, 3000-, or 4000-level course except the former 2000, 2005, the former 2010, the former 2011, 3202, 3402, or 4502.
 - b. Biology: Any 2000-, 3000-, or 4000-level course except 2040, 2041, 2120, 3053, or 3820.
 - c. Chemistry: 2100, 2210, 2301 (or the former Chemistry 2300), 2302, 2400, 2401, 2610, or any 3000 or 4000 level course.
 - d. Computer Science: Any 2000, 3000, or 4000 level course except the former 2650 and the former 2801.
 - e. Ocean Sciences: any 2000-, 3000-, or 4000-level course.
 - f. Mathematics: 2000, 2050, 2051, 2260, 2320, or any 3000 or 4000 level mathematics course.
 - g. Medicine 310A/B.
 - h. Physics: Any 2000, 3000, or 4000 level course except <u>2150,</u> 2151, 3150, 3151.

Notes:

- 3. Credit may not be obtained for both Biology 3750 and Psychology 3750 or for both Biology 4701 and Psychology 4701.
- 4. The courses listed under Clause 3 may have prerequisites. It is the student's responsibility to ensure that all prerequisites have been met, or that waivers have been obtained, before registering for these courses.

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

CONSULTATIONS SOUGHT

From **Response Received Grenfell Campus** Faculty of Business Administration Faculty of Education Faculty of Engineering & Applied Science YES Faculty of Humanities & Social Sciences Faculty of Science Department of Biochemistry Department of Biology Department of Chemistry **Department of Computer Sciences Department of Earth Sciences** Department of Economics Department of Geography **Department of Mathematics and Statistics** Department of Physics and Physical Oceanography Marine Institute School of Human Kinetics and Recreation YES YES School of Medicine School of Music YES School of Nursing School of Pharmacy School of Social Work

RESOURCE IMPLICATIONS

There are no resource implications associated with the proposed changes.

Subject Re: Psychology Department Calendar Change- Consultations Requested

```
From Engineering Consult
```

To Deputy Head, Department of Psychology

Date Wed 08:43

Hi, Thank

Thanks for giving us the opportunity to provide feedback on the proposed calendar changes. The Faculty of Engineering and Applied Science Committee on Undergraduate Studies does not anticipate any impact of the proposed changes on engineering programs. Sincerely,

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

Subject Re: Psychology Department Calendar Change- Consultations Requested

From <u>HKR Dean</u>

To Deputy Head, Department of Psychology

Date 2022-11-16 14:09

Hello,

Thank you for the opportunity to review. HKR has no comments or concerns.

Anne-Marie

Anne-Marie Sullivan (she/her), PhD, CTRS Interim Dean, School of Human Kinetics & Recreation Memorial University, St. John's, NL, A1S 5S7 (p) 709-864-8129; (e) hkrdean@mun.ca

Subject Fwd: Psychology Department Calendar Change- Consultations Requested

From Michelle Cheramy

To psychdeputyhead@mun.ca

Date 2022-11-12 17:59

- <u>Calendar_PSYC_11-11_Regs_Admit_Major.pdf (</u>~79 KB)
- Calendar PSYC 10-2-10 Biol BHNR.pdf (~54 KB)
- <u>Calendar Psyc 4910.pdf (</u>~47 KB)
- <u>Calendar Psyc 3810.pdf</u> (~54 KB)

Dear Psychology,

The School of Music has no issues with the proposed changes.

Best wishes,

Michelle Cheramy

Michelle Cheramy, DMA (she/her)

Acting Associate Dean, School of Music Memorial University of Newfoundland St. John's, NL, Canada <u>mcheramy@mun.ca</u>

Subject Re: Psychology Department Calendar Change- Consultations Requested

From medvicedean

To psychdeputyhead@mun.ca

Cc <u>DeanofMedicine@med.mun.ca</u>

Date 2022-11-07 19:16

Hi Dr. Walsh, I have reviewed the four dept of Psychology proposed changes. From the FoM perspective, I have no concerns or comments. Thank you for the opportunity to review.

Dolores M McKeen MD FRCPC MSc CCPE Vice Dean | Education & Faculty Affairs Professor | Memorial University of Newfoundland <<u>https://www.mun.ca/</u>> Past President | Canadian Anesthesiologists' Society <<u>https://www.cas.ca/en/home</u>> @dolores_mckeen

Faculty of Medicine <<u>http://www.med.mun.ca/</u>>
Memorial University of Newfoundland

Faculty of Medicine Building | Rm 2M315 300 Prince Philip Drive St. John's NL CA A1B 3V6 T: 709 864 6417 | F: 709 864 6336

----Original Message-----From: Deputy Head, Department of Psychology [mailto:psychdeputyhead@mun.ca] Sent: Monday, November 7, 2022 4:07 PM To: hss@mun.ca; eoldford@mun.ca; efurey@mun.ca; engrconsult@mun.ca; hkrdean@mun.ca ; Steele, Dr. Margaret: Dean of Medicine <<u>DeanofMedicine@med.mun.ca</u>; kbulmer@mun.ca; deanNurse@mun.ca; pharminfo@mun.ca; deans ci@mun.ca; adeanugradswk@mun.ca; univlib@mun.ca; ipercy@grenfell.mun.ca; ssedean@grenf ell.mun.ca; thennessey@grenfell.mun.ca; miugconsultations@mi.mun.ca; Cunsolo, Ashlee <<u>ashlee.cunsolo@mun.ca</u>>

Subject: Psychology Department Calendar Change- Consultations Requested

Hello-

Please find four proposed Calendar changes from the Psychology Department (St. John's campus) that we request you provide any feedback on no later than Monday, November 28th. Comments can be directed to me at psychologythead@mun.ca.

Summary of Changes (by attachment name):

1. Calendar_PSYC_11-11_Regs_Admit_Major: This change involves additions to the courses we require for admission to the major, as well as to the majors in Psychology and Behavioural Neuroscience. The changes are of two types: 1) additions of the proposed Statistics 1500 course to these regulations, should the course be approved, as we strongly endorse this course for our majors; and 2) modifications of the list of Mathematics and Physics courses that our Behavioural Neuroscience majors may/may not complete to fulfill the degree requirement of 18 CH in "other" sciences, based on feedback we received during last year's round of consultations.

2. Calendar_PSYC_10-2-10_Biol_BHNR: A change to correct an omission from last year's Calendar change in which Math 1001 was removed from the Behavioural Neuroscience major/Honours; we neglected to remove the course from the program requirements of 10.2.10. Joint Honours in Biology and Psychology (Behavioural Neuroscience) Honours program.

3. Calendar_Psyc_4910: A name change to our PSYC 4910 course to better reflect the course's content (from "Contemporary Systems in Psychology" to "History of Psychology").

4. Calendar_Psyc_3810: A pre-requisite addition for PSYC 3810 (Neurobiology of Learning and Memory) of Psyc 3800 (Cellular and Molecular Neuroscience) to better prepare students for the course material.

Best, Carolyn

Carolyn Walsh, PhD (she/her) Associate Professor Deputy Head, Psychology Memorial University St. John's, NL, A1B 3X9 phone: 709-864-4738 fax: 709-864-2430 e-mail: <u>psychdeputyhead@mun.ca</u>

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- \Box New course(s):
- \Box Amended or deleted course(s):
- \Box New program(s):
- X Amended or deleted program(s):

10.2.10 Biology and Psychology (Behavioural Neuroscience) Joint Honours

- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council: _____

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Programs

PROGRAM TITLE 10.2.10 Biology and Psychology (Behavioural Neuroscience) Joint Honours

RATIONALE

The Psychology Department removed Math 1001 as a requirement for the Major and Honours in Behavioural Neuroscience program last year. It appears that there was an omission in that we did not remove the course from the Biology and Psychology (Behavioural Neuroscience) Joint Honours program. Math 1001 is not required in the Biology Honours program. This calendar change corrects the omission.

In anticipation of the approval of the course proposal for Mathematics 1006, the wording "(or equivalent)" has been added to the mentions of Mathematics 1000 throughout the regulations. This wording is also captured in the proposed secondary Calendar changes for the Mathematics 1006 course, but is added here for clarity.

CALENDAR CHANGES

10.2.10 Biology and Psychology (Behavioural Neuroscience) Joint Honours *Note:*

Students completing this program cannot receive credit for Psychology 2920. The following courses (or equivalent) are required:

- 1. Biology 1001, 1002, 2060, 2250, 2600, 2900; one of 3401, 3402, 4245, 4404; five Biology electives at the 2000, 3000 or 4000 level not including Biology 499A or 499B.
- Psychology 1000, 1001, 2521, 2910, 2911, 2930; one of the former PSYC 3250, 3810, 3830, 3840, or 3860; 3800, 3820, 3900; one further course in Psychology chosen from the following: 3050, 3100, 3251, 3350, 3450, 3620, 3650, 3750; any research experience course and one of Psychology 4850, 4851, 4852, 4853, or 4854; or, any selected topics course and Psychology 4870.
- 3. Biology or Psychology 499A/B.
- 4. Biochemistry 2201 or the former 2101,3206 or 3106.
- 5. Six credit hours in **Critical Reading and Writing (CRW)** courses, including at least 3 credit hours in English courses.
- Mathematics 1000 (or equivalent) and 1001; Physics 1020 (or 1050) and 1021 (or 1051); Chemistry 1050 (or 1200), 1051 (or 1001), 2400, and 2401.

7. Other courses, if necessary, to complete at least 120 credit hours of courses. *Note:*

As provided for under the **Graduation Requirements** for the Honours Degree of Bachelor of Science, Honours students must obtain a grade of "B" or better, OR average of 75% or higher in all the required courses listed in Clauses 1, 2, 3, and 4 above, except those at the 1000 level.

CALENDAR ENTRY AFTER CHANGES

10.2.10 Biology and Psychology (Behavioural Neuroscience) Joint Honours *Note:*

Students completing this program cannot receive credit for Psychology 2920. The following courses (or equivalent) are required:

- 1. Biology 1001, 1002, 2060, 2250, 2600, 2900; one of 3401, 3402, 4245, 4404; five Biology electives at the 2000, 3000 or 4000 level not including Biology 499A or 499B.
- Psychology 1000, 1001, 2521, 2910, 2911, 2930; one of the former PSYC 3250, 3810, 3830, 3840, or 3860; 3800, 3820, 3900; one further course in Psychology chosen from the following: 3050, 3100, 3251, 3350, 3450, 3620, 3650, 3750; any research experience course and one of Psychology 4850, 4851, 4852, 4853, or 4854; or, any selected topics course and Psychology 4870.
- 3. Biology or Psychology 499A/B.
- 4. Biochemistry 2201 or the former 2101,3206 or 3106.
- 5. Six credit hours in **Critical Reading and Writing (CRW)** courses, including at least 3 credit hours in English courses.
- 6. Mathematics 1000 (or equivalent); Physics 1020 (or 1050) and 1021 (or 1051); Chemistry 1050 (or 1200), 1051 (or 1001), 2400, and 2401.
- 7. Other courses, if necessary, to complete at least 120 credit hours of courses.

Note:

As provided for under the **Graduation Requirements** for the Honours Degree of Bachelor of Science, Honours students must obtain a grade of "B" or better, OR average of 75% or higher in all the required courses listed in Clauses 1, 2, 3, and 4 above, except those at the 1000 level.

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

CONSULTATIONS SOUGHT

From	Response Received
Grenfell Campus	
Faculty of Business Administration	
Faculty of Education	
Faculty of Engineering & Applied Science	YES
Faculty of Humanities & Social Sciences	
Faculty of Science	
Department of Biochemistry	
Department of Biology	YES
Department of Chemistry	
Department of Computer Sciences	
Department of Earth Sciences	
Department of Economics	
Department of Geography	
Department of Mathematics and Statistics	
Department of Physics and Physical Oceanography	
Marine Institute	
School of Human Kinetics and Recreation	YES
School of Medicine	YES
School of Music	YES
School of Nursing	
School of Pharmacy	
School of Social Work	

RESOURCE IMPLICATIONS

There are no resource implications associated with the proposed changes.

Paper 5.A.m. (pages 100-107)

Subject Re: Psychology Department Calendar Change- Consultations Requested

From Engineering Consult

To Deputy Head, Department of Psychology

Date Wed 08:43

Ηi,

Thanks for giving us the opportunity to provide feedback on the proposed calendar changes. The Faculty of Engineering and Applied Science Committee on Undergraduate Studies does not anticipate any impact of the proposed changes on engineering programs. Sincerely,

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

Subject Re: Psychology Department Calendar Change- Consultations Requested

From <u>HKR Dean</u>

To Deputy Head, Department of Psychology

Date 2022-11-16 14:09

Hello,

Thank you for the opportunity to review. HKR has no comments or concerns.

Anne-Marie

Anne-Marie Sullivan (she/her), PhD, CTRS Interim Dean, School of Human Kinetics & Recreation Memorial University, St. John's, NL, A1S 5S7 (p) 709-864-8129; (e) hkrdean@mun.ca

Subject Fwd: Psychology Department Calendar Change- Consultations Requested

From Michelle Cheramy

To psychdeputyhead@mun.ca

Date 2022-11-12 17:59

- <u>Calendar_PSYC_11-11_Regs_Admit_Major.pdf</u> (~79 KB)
- Calendar PSYC 10-2-10 Biol BHNR.pdf (~54 KB)
- <u>Calendar Psyc 4910.pdf (</u>~47 KB)
- <u>Calendar Psyc 3810.pdf (~54 KB)</u>

Dear Psychology,

The School of Music has no issues with the proposed changes.

Best wishes,

Michelle Cheramy

Michelle Cheramy, DMA (she/her)

Acting Associate Dean, School of Music Memorial University of Newfoundland St. John's, NL, Canada <u>mcheramy@mun.ca</u>

Subject Re: Psychology Department Calendar Change- Consultations Requested

From medvicedean

To psychdeputyhead@mun.ca

Cc <u>DeanofMedicine@med.mun.ca</u>

Date 2022-11-07 19:16

Hi Dr. Walsh, I have reviewed the four dept of Psychology proposed changes. From the FoM perspective, I have no concerns or comments. Thank you for the opportunity to review.

Dolores M McKeen MD FRCPC MSc CCPE Vice Dean | Education & Faculty Affairs Professor | Memorial University of Newfoundland <<u>https://www.mun.ca/</u>> Past President | Canadian Anesthesiologists' Society <<u>https://www.cas.ca/en/home</u>> @dolores_mckeen

Faculty of Medicine <<u>http://www.med.mun.ca/</u>>
Memorial University of Newfoundland

Faculty of Medicine Building | Rm 2M315 300 Prince Philip Drive St. John's NL CA A1B 3V6 T: 709 864 6417 | F: 709 864 6336

----Original Message-----From: Deputy Head, Department of Psychology [mailto:psychdeputyhead@mun.ca] Sent: Monday, November 7, 2022 4:07 PM To: hss@mun.ca; eoldford@mun.ca; efurey@mun.ca; engrconsult@mun.ca; hkrdean@mun.ca ; Steele, Dr. Margaret: Dean of Medicine <<u>DeanofMedicine@med.mun.ca</u>; kbulmer@mun.ca; deanNurse@mun.ca; pharminfo@mun.ca; deans ci@mun.ca; adeanugradswk@mun.ca; univlib@mun.ca; ipercy@grenfell.mun.ca; ssedean@grenf ell.mun.ca; thennessey@grenfell.mun.ca; miugconsultations@mi.mun.ca; Cunsolo, Ashlee <<u>ashlee.cunsolo@mun.ca</u>>

Subject: Psychology Department Calendar Change- Consultations Requested

Hello-

Please find four proposed Calendar changes from the Psychology Department (St. John's campus) that we request you provide any feedback on no later than Monday, November 28th. Comments can be directed to me at psychologythead@mun.ca.

Summary of Changes (by attachment name):

1. Calendar_PSYC_11-11_Regs_Admit_Major: This change involves additions to the courses we require for admission to the major, as well as to the majors in Psychology and Behavioural Neuroscience. The changes are of two types: 1) additions of the proposed Statistics 1500 course to these regulations, should the course be approved, as we strongly endorse this course for our majors; and 2) modifications of the list of Mathematics and Physics courses that our Behavioural Neuroscience majors may/may not complete to fulfill the degree requirement of 18 CH in "other" sciences, based on feedback we received during last year's round of consultations.

2. Calendar_PSYC_10-2-10_Biol_BHNR: A change to correct an omission from last year's Calendar change in which Math 1001 was removed from the Behavioural Neuroscience major/Honours; we neglected to remove the course from the program requirements of 10.2.10. Joint Honours in Biology and Psychology (Behavioural Neuroscience) Honours program.

3. Calendar_Psyc_4910: A name change to our PSYC 4910 course to better reflect the course's content (from "Contemporary Systems in Psychology" to "History of Psychology").

4. Calendar_Psyc_3810: A pre-requisite addition for PSYC 3810 (Neurobiology of Learning and Memory) of Psyc 3800 (Cellular and Molecular Neuroscience) to better prepare students for the course material.

Best, Carolyn

Carolyn Walsh, PhD (she/her) Associate Professor Deputy Head, Psychology Memorial University St. John's, NL,

```
A1B 3X9
phone: 709-864-4738
fax: 709-864-2430
e-mail: psychdeputyhead@mun.ca
```

Subject RE: Calendar Change- Heads Up

From Biology Academic Program Officer

To Deputy Head, Department of Psychology

Cc <u>Wiersma, Yolanda</u>

Date 2022-11-01 11:11

Hi Carolyn,

No issues on our end (Yolanda is sitting across for me)!

Best,

Andrew Chaulk | Academic Program Officer Department of Biology Memorial University of Newfoundland St. John's, Newfoundland

T: 709 864-8021 E: <u>bioapo@mun.ca</u> Office: CSF 2344 www.mun.ca/biology

----Original Message-----From: Deputy Head, Department of Psychology <<u>psychdeputyhead@mun.ca</u>> Sent: Tuesday, November 1, 2022 11:06 AM To: Biology Academic Program Officer <<u>BioAPO@mun.ca</u>>; Wiersma, Yolanda <<u>ywiersma@mun.ca</u>> Subject: Calendar Change- Heads Up

Hi Andrew and Yolanda-

I just wanted to give you a heads up that we are going to send out a Calendar change for consultation that affects the Joint Honours in Biology and Psychology (Behavioural Neuroscience)- see attached.

It's just a housekeeping change needed that was brought to my attention a couple of days ago by the Academic Advising Centre. Apparently, when we removed Math 1001 from our BHNR programs last year, this one got left in. I know that you don't require Math 1001 for your Biology Honours degrees, so can I assume that you are good with this? If not, please let me know!

Best, Carolyn

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- \Box New course(s):
- X Amended or deleted course(s): PSYCHOLOGY 4910 Contemporary Systems in Psychology
- □ New program(s):
- \Box Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council:
COURSE NUMBER AND TITLE

PSYCHOLOGY 4910 Systems in Contemporary Psychology

REVISED COURSE NUMBER AND TITLE

PSYCHOLOGY 4910 History of Psychology

ABBREVIATED COURSE TITLE

History of Psychology

RATIONALE

The current course title "Systems in Contemporary Psychology" is somewhat elusive in its meaning and is often a source of confusion to students. In addition, our Psychology majors who apply to clinical psychology graduate programs are required to have completed an undergraduate course in the History of Psychology. While Psyc 4910 has been used to fulfill this requirement, it has been unclear to some committees evaluating applicants that this course is, in fact, a course in the history of psychology. The name change, then, is put forward to make the content of the course more transparent to both students and any bodies required to evaluate student transcripts.

CALENDAR CHANGES

Psychology 4910 Systems in Contemporary Psychology History of Psychology

is a study of paradigms and explanations in contemporary psychology in the context of their historical antecedents.

CO: at the St. John's campus only: PSYC 3900 or 3950, or permission of instructor PR: 30 credit hours in Psychology courses required in a Majors program. At the Grenfell Campus only, this must include PSYC 2950.

CALENDAR ENTRY AFTER CHANGES

Psychology 4910 History of Psychology is a study of paradigms and explanations in contemporary psychology in the context of their historical antecedents. CO: at the St. John's campus only: PSYC 3900 or 3950, or permission of instructor PR: 30 credit hours in Psychology courses required in a Majors program. At the Grenfell Campus only, this must include PSYC 2950.

SECONDARY CALENDAR CHANGES

(Grenfell Campus)

13.25.3 Senior Courses

4910

Systems History of Psychology

is a study of paradigms and explanations in contemporary psychology in the context of their historical antecedents.

CO: At the St. John's campus only: PSYC 3900 or 3950, or permission of instructor

PR: 30 credit hours in Psychology courses required in a Majors program. At the Grenfell Campus only, this must include PSYC 2950.

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

CONSULTATIONS SOUGHT

From

From	Response Received
Grenfell Campus	YES (informal, Psychology)
Faculty of Business Administration	
Faculty of Education	
Faculty of Engineering & Applied Science	YES
Faculty of Humanities & Social Sciences	
Faculty of Science	
Department of Biochemistry	
Department of Biology	
Department of Chemistry	
Department of Computer Sciences	
Department of Earth Sciences	
Department of Economics	
Department of Geography	
Department of Mathematics and Statistics	
Department of Physics and Physical Oceanography	
Marine Institute	
School of Human Kinetics and Recreation	YES
School of Medicine	YES
School of Music	YES
School of Nursing	
School of Pharmacy	
School of Social Work	

RESOURCE IMPLICATIONS

There are no resource implications associated with the proposed changes.

Re: Psychology Department Calendar Change- Consultations Requested

From Engineering Consult

```
To Deputy Head, Department of Psychology
```

Date Wed 08:43

Ηi,

```
Thanks for giving us the opportunity to provide feedback on the proposed calendar
changes. The Faculty of Engineering and Applied Science Committee on Undergraduate
Studies does not anticipate any impact of the proposed changes on engineering
programs.
Sincerely,
```

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

Subject Re: Psychology Department Calendar Change- Consultations Requested

From <u>HKR Dean</u>

```
To Deputy Head, Department of Psychology
```

Date 2022-11-16 14:09

Hello,

Thank you for the opportunity to review. HKR has no comments or concerns.

Anne-Marie

```
Anne-Marie Sullivan (she/her), PhD, CTRS
Interim Dean, School of Human Kinetics & Recreation
Memorial University, St. John's, NL, A1S 5S7
(p) 709-864-8129; (e) hkrdean@mun.ca
```

Subject Fwd: Psychology Department Calendar Change- Consultations Requested

From Michelle Cheramy

```
To psychdeputyhead@mun.ca
```

Date 2022-11-12 17:59

- <u>Calendar_PSYC_11-11_Regs_Admit_Major.pdf</u> (~79 KB)
- <u>Calendar PSYC 10-2-10 Biol BHNR.pdf</u> (~54 KB)
- <u>Calendar Psyc 4910.pdf (~47 KB)</u>
- Calendar Psyc 3810.pdf (~54 KB)

Dear Psychology, The School of Music has no issues with the proposed changes. Best wishes, Michelle Cheramy

Michelle Cheramy, DMA (she/her)

Acting Associate Dean, School of Music Memorial University of Newfoundland St. John's, NL, Canada mcheramy@mun.ca

Subject Re: Psychology Department Calendar Change- Consultations Requested

From medvicedean

- To psychdeputyhead@mun.ca
- Cc <u>DeanofMedicine@med.mun.ca</u>

Date 2022-11-07 19:16

Hi Dr. Walsh, I have reviewed the four dept of Psychology proposed changes. From the FoM perspective, I have no concerns or comments. Thank you for the opportunity to review.

Dolores M McKeen MD FRCPC MSc CCPE Vice Dean | Education & Faculty Affairs Professor | Memorial University of Newfoundland <<u>https://www.mun.ca/></u> Past President | Canadian Anesthesiologists' Society <<u>https://www.cas.ca/en/home</u>> @dolores_mckeen

Faculty of Medicine <<u>http://www.med.mun.ca/</u>> Memorial University of Newfoundland Faculty of Medicine Building | Rm 2M315 300 Prince Philip Drive St. John's NL CA A1B 3V6 T: 709 864 6417 | F: 709 864 6336

----Original Message-----From: Deputy Head, Department of Psychology [mailto:psychdeputyhead@mun.ca] Sent: Monday, November 7, 2022 4:07 PM To: hss@mun.ca; eoldford@mun.ca; efurey@mun.ca; engrconsult@mun.ca; hkrdean@mun.ca ; Steele, Dr. Margaret: Dean of Medicine <DeanofMedicine@med.mun.ca>; kbulmer@mun.ca; deanNurse@mun.ca; pharminfo@mun.ca; deans ci@mun.ca; adeanugradswk@mun.ca; univlib@mun.ca; ipercy@grenfell.mun.ca; ssedean@grenf ell.mun.ca; thennessey@grenfell.mun.ca; miugconsultations@mi.mun.ca; Cunsolo, Ashlee <ashlee.cunsolo@mun.ca>

Subject: Psychology Department Calendar Change- Consultations Requested

Hello-

Please find four proposed Calendar changes from the Psychology Department (St. John's campus) that we request you provide any feedback on no later than Monday, November 28th. Comments can be directed to me at psychologythead@mun.ca.

Summary of Changes (by attachment name):

1. Calendar_PSYC_11-11_Regs_Admit_Major: This change involves additions to the courses we require for admission to the major, as well as to the majors in Psychology and Behavioural Neuroscience. The changes are of two types: 1) additions of the proposed Statistics 1500 course to these regulations, should the course be approved, as we strongly endorse this course for our majors; and 2) modifications of the list of Mathematics and Physics courses that our Behavioural Neuroscience majors may/may not complete to fulfill the degree requirement of 18 CH in "other" sciences, based on feedback we received during last year's round of consultations.

2. Calendar PSYC 10-2-10 Biol BHNR: A change to correct an omission from last

year's Calendar change in which Math 1001 was removed from the Behavioural Neuroscience major/Honours; we neglected to remove the course from the program requirements of 10.2.10. Joint Honours in Biology and Psychology (Behavioural Neuroscience) Honours program.

3. Calendar_Psyc_4910: A name change to our PSYC 4910 course to better reflect the course's content (from "Contemporary Systems in Psychology" to "History of Psychology").

4. Calendar_Psyc_3810: A pre-requisite addition for PSYC 3810 (Neurobiology of Learning and Memory) of Psyc 3800 (Cellular and Molecular Neuroscience) to better prepare students for the course material.

```
Best,
Carolyn
```

--Carolyn Walsh, PhD (she/her) Associate Professor Deputy Head, Psychology Memorial University St. John's, NL, A1B 3X9 phone: 709-864-4738 fax: 709-864-2430 e-mail: psychdeputyhead@mun.ca

Subject Re: Informal Consultation re: Psyc 4910

From Holfeld, Brett 👗

To Deputy Head, Department of Psychology

Date 2022-11-04 12:12

It looks like everyone is fully supportive of this change Carolyn - in fact we have been calling it History of Psychology for many years anyways! Thanks for reaching out.

Brett

Brett Holfeld | Associate Professor Chair, Psychology Program (AS 346) Grenfell Campus, Memorial University of Newfoundland 20 University Drive Corner Brook, NL | A2H 5G4

From: Deputy Head, Department of Psychology <<u>psychdeputyhead@mun.ca</u>>
Sent: November 3, 2022 4:23 PM
To: Holfeld, Brett
Subject: Re: Informal Consultation re: Psyc 4910

Sorry about the misspelling of your name, Brett.

Just to be clear, Grenfell will get the opportunity to provide commentary on the formal Calendar change when we send it out for consultation- this was just a first draft sent specifically to your Department for any informal feedback you might have to offer, since you offer the same (currently similarly-named!) course.

After speaking to my clinical colleague this afternoon, I think I will

also be updating the rationale. The requirement to have a History of Psychology course is for eligibility for licensing/registration as a clinical psychologist, not necessarily related to the CPA-accreditation process for clinical psychology graduate programs. However, clinical programs don't often offer the history course, so effectively students need it at the undergraduate level.

Best, Carolyn

On 2022-11-03 15:15, Holfeld, Brett wrote: Hi Carolyn,

It's actually Brett, not Brent. I will reach out to our faculty to get some feedback but given the short turn around, I am not sure how much I will have for you.

Brett

Brett Holfeld | Associate Professor Chair, Psychology Program (AS 346) Grenfell Campus, Memorial University of Newfoundland 20 University Drive Corner Brook, NL | A2H 5G4

From: Deputy Head, Department of Psychology <<u>psychdeputyhead@mun.ca</u>>
Sent: November 3, 2022 1:59 PM
To: Holfeld, Brett
Subject: Informal Consultation re: Psyc 4910

Hi Brent-I just wanted to reach out to you at Grenfell to let you know that we are consulting with our Department this coming Monday about changing the name of our PSYC 4910 course from "Contemporary Systems in Psychology" to "History of Psychology". I know that you offer PSYC 4910 under the name "Systems in Psychology".

Our rationale is basically this: we have gotten some feedback via our clinical people, in particular, that based on the course title, it is not obvious that this is really a history of psychology course. This matters to our undergrads who want to go onto apply to clinical programs, as they are required to have a History of Psychology undergrad course (it is apparently a CPA-accreditation thing).

We won't send out a formal consultation to all hands until after this gets approved on Monday by the Department, but we just wanted to give you a chance to provide any early informal feedback if you like. I've attached the draft of our Calendar Change.

Best, Carolyn

--

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- \Box New course(s):
- X Amended or deleted course(s): PSYCHOLOGY 3810 Neurobiology of Learning and Memory
- \Box New program(s):
- □ Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council: _____

COURSE NUMBER AND TITLE

Psychology 3810 Neurobiology of Learning and Memory

RATIONALE

Currently, Psychology 3810 Neurobiology of Learning and Memory has only the 2000level Psychology majors courses as pre-requisites. It has become evident that students taking this course would benefit greatly from taking Psychology 3800 Cellular and Molecular Neuroscience *prior to* enrolling in Psyc 3810, as the material covered in Psyc 3800 is foundational. This Calendar change adds Psyc 3800 as a pre-requisite to Psyc 3810.

CALENDAR CHANGES

Psychology 3810 Neurobiology of Learning and Memory (same as the former PSYC 3250) examines how organisms adjust their behaviour to regularities in the environment as a result of experience. Experience changes behavior by modifying the nervous system. We will take a multidisciplinary approach, combining information from psychology and neuroscience to study learning and memory. Students will gain an understanding of sensitization, habituation, and classical and operant conditioning using animal models, with a particular emphasis on the synaptic and molecular changes that occur with learning and memory.

CR: PSYC 2825, the former PSYC 3250

PR: PSYC 2520 or 2521, 2911, and 2930 or the former 2570, <u>Psychology 3800</u>, and admission to a Major in Psychology or Behavioural Neuroscience

CALENDAR ENTRY AFTER CHANGES

Psychology 3810 Neurobiology of Learning and Memory (same as the former PSYC 3250) examines how organisms adjust their behaviour to regularities in the environment as a result of experience. Experience changes behavior by modifying the nervous system. We will take a multidisciplinary approach, combining information from psychology and neuroscience to study learning and memory. Students will gain an understanding of sensitization, habituation, and classical and operant conditioning using animal models, with a particular emphasis on the synaptic and molecular changes that occur with learning and memory.

CR: PSYC 2825, the former PSYC 3250

PR: PSYC 2520 or 2521, 2911, 2930 or the former 2570, Psychology 3800, and admission to a Major in Psychology or Behavioural Neuroscience

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

CONSULTATIONS SOUGHT

From **Response Received Grenfell Campus** Faculty of Business Administration Faculty of Education Faculty of Engineering & Applied Science YES Faculty of Humanities & Social Sciences Faculty of Science Department of Biochemistry Department of Biology Department of Chemistry **Department of Computer Sciences Department of Earth Sciences** Department of Economics Department of Geography **Department of Mathematics and Statistics** Department of Physics and Physical Oceanography Marine Institute School of Human Kinetics and Recreation YES School of Medicine YES School of Music YES School of Nursing School of Pharmacy School of Social Work

RESOURCE IMPLICATIONS

There are no resource implications associated with the proposed changes.

Subject Re: Psychology Department Calendar Change- Consultations Requested

```
From Engineering Consult
```

To Deputy Head, Department of Psychology

Date Wed 08:43

Ηi,

Thanks for giving us the opportunity to provide feedback on the proposed calendar changes. The Faculty of Engineering and Applied Science Committee on Undergraduate Studies does not anticipate any impact of the proposed changes on engineering programs. Sincerely,

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

Subject Re: Psychology Department Calendar Change- Consultations Requested

From <u>HKR Dean</u>

To Deputy Head, Department of Psychology

Date 2022-11-16 14:09

Hello,

Thank you for the opportunity to review. HKR has no comments or concerns.

Anne-Marie

Anne-Marie Sullivan (she/her), PhD, CTRS Interim Dean, School of Human Kinetics & Recreation Memorial University, St. John's, NL, A1S 5S7 (p) 709-864-8129; (e) hkrdean@mun.ca

Subject Fwd: Psychology Department Calendar Change- Consultations Requested

From Michelle Cheramy

To psychdeputyhead@mun.ca

Date 2022-11-12 17:59

- <u>Calendar_PSYC_11-11_Regs_Admit_Major.pdf (</u>~79 KB)
- <u>Calendar PSYC 10-2-10 Biol BHNR.pdf</u> (~54 KB)
- <u>Calendar Psyc 4910.pdf (~47 KB)</u>
- <u>Calendar Psyc 3810.pdf</u> (~54 KB)

Dear Psychology,

The School of Music has no issues with the proposed changes.

Best wishes,

Michelle Cheramy

Michelle Cheramy, DMA (she/her)

Acting Associate Dean, School of Music Memorial University of Newfoundland St. John's, NL, Canada <u>mcheramy@mun.ca</u>

Subject Re: Psychology Department Calendar Change- Consultations Requested

From medvicedean

To psychdeputyhead@mun.ca

Cc <u>DeanofMedicine@med.mun.ca</u>

Date 2022-11-07 19:16

Hi Dr. Walsh, I have reviewed the four dept of Psychology proposed changes. From the FoM perspective, I have no concerns or comments. Thank you for the opportunity to review.

Dolores M McKeen MD FRCPC MSc CCPE Vice Dean | Education & Faculty Affairs Professor | Memorial University of Newfoundland <<u>https://www.mun.ca/</u>> Past President | Canadian Anesthesiologists' Society <<u>https://www.cas.ca/en/home</u>> @dolores_mckeen

Faculty of Medicine <<u>http://www.med.mun.ca/</u>>
Memorial University of Newfoundland

Faculty of Medicine Building | Rm 2M315 300 Prince Philip Drive St. John's NL CA A1B 3V6 T: 709 864 6417 | F: 709 864 6336

----Original Message-----From: Deputy Head, Department of Psychology [mailto:psychdeputyhead@mun.ca] Sent: Monday, November 7, 2022 4:07 PM To: hss@mun.ca; eoldford@mun.ca; efurey@mun.ca; engrconsult@mun.ca; hkrdean@mun.ca ; Steele, Dr. Margaret: Dean of Medicine <<u>DeanofMedicine@med.mun.ca</u>; kbulmer@mun.ca; deanNurse@mun.ca; pharminfo@mun.ca; deans ci@mun.ca; adeanugradswk@mun.ca; univlib@mun.ca; ipercy@grenfell.mun.ca; ssedean@grenf ell.mun.ca; thennessey@grenfell.mun.ca; miugconsultations@mi.mun.ca; Cunsolo, Ashlee <<u>ashlee.cunsolo@mun.ca</u>>

Subject: Psychology Department Calendar Change- Consultations Requested

Hello-

Please find four proposed Calendar changes from the Psychology Department (St. John's campus) that we request you provide any feedback on no later than Monday, November 28th. Comments can be directed to me at psychologythead@mun.ca.

Summary of Changes (by attachment name):

1. Calendar_PSYC_11-11_Regs_Admit_Major: This change involves additions to the courses we require for admission to the major, as well as to the majors in Psychology and Behavioural Neuroscience. The changes are of two types: 1) additions of the proposed Statistics 1500 course to these regulations, should the course be approved, as we strongly endorse this course for our majors; and 2) modifications of the list of Mathematics and Physics courses that our Behavioural Neuroscience majors may/may not complete to fulfill the degree requirement of 18 CH in "other" sciences, based on feedback we received during last year's round of consultations.

2. Calendar_PSYC_10-2-10_Biol_BHNR: A change to correct an omission from last year's Calendar change in which Math 1001 was removed from the Behavioural Neuroscience major/Honours; we neglected to remove the course from the program requirements of 10.2.10. Joint Honours in Biology and Psychology (Behavioural Neuroscience) Honours program.

3. Calendar_Psyc_4910: A name change to our PSYC 4910 course to better reflect the course's content (from "Contemporary Systems in Psychology" to "History of Psychology").

4. Calendar_Psyc_3810: A pre-requisite addition for PSYC 3810 (Neurobiology of Learning and Memory) of Psyc 3800 (Cellular and Molecular Neuroscience) to better prepare students for the course material.

Best, Carolyn

Carolyn Walsh, PhD (she/her) Associate Professor Deputy Head, Psychology Memorial University St. John's, NL,

Paper 5.A.o. (pages 116-122)

A1B 3X9 phone: 709-864-4738 fax: 709-864-2430 e-mail: psychdeputyhead@mun.ca

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- X New course:
- \Box Amended or deleted course(s):
- □ New program(s):
- \Box Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council: _____

COURSE NUMBER AND TITLE

COMP 3730 - Introduction to Parallel Programming

RATIONALE

Multi-threaded programming has become ubiquitous on modern computing systems. Nearly all processors contain multiple computing cores, since the performance of an individual processor has reached peak performance. This architecture-level parallelism is expected to increase in future. Programming for multi-core CPUs or GPUs requires specialized techniques to handle multiple concurrent threads of execution. Currently, there is no undergraduate course in Computer Science that is focused on parallel programming.

CALENDAR CHANGES

3730 Introduction to Parallel Programming considers the fundamental aspects of programming for parallel architectures. Almost all modern computers contain multiple processing units, since individual processors have effectively reached peak performance. This course will focus on the considerations and challenges of writing parallel programs, particularly for multicore processors and graphics processing units. Topics will include threaded programming, vectorization, parallel design patterns, synchronization and workload balancing, high-performance computing, remote procedure calls, detecting failures, and cloud systems. CR: ECE 7400

PR: COMP 2001, COMP 2004

CALENDAR ENTRY AFTER CHANGES

3730 Introduction to Parallel Programming considers the fundamental aspects of programming for parallel architectures. Almost all modern computers contain multiple processing units, since individual processors have effectively reached peak performance. This course will focus on the considerations and challenges of writing parallel programs, particularly for multicore processors and graphics processing units. Topics will include threaded programming, vectorization, parallel design patterns, synchronization and workload balancing, high-performance computing, remote procedure calls, detecting failures, and cloud systems. CR: ECE 7400

PR: COMP 2001, COMP 2004

SECONDARY CALENDAR CHANGES

None.

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

CONSULTATIONS SOUGHT

Academic Advising Centre
Humanities and Social Sciences
Business Administration
Education
Engineering and Applied Science
Grenfell Campus (Arts & Social Sciences)
Grenfell Campus (Science and the Environment)
Grenfell Campus (Fine Arts)
Human Kinetics and Recreation
Library
Marine Institute
Medicine
Music
Nursing
Pharmacy
Social Work
Science
Biochemistry
Biology
Chemistry
Earth Sciences
Geography
Mathematics and Statistics
Ocean Sciences
 Physics and Physical Oceanography

LIBRARY REPORT

No additional requirements.

RESOURCE IMPLICATIONS

This course will be taught by a faculty member with expertise in parallel programming. There are no resource implications.

ADDITIONAL INFORMATION REQUIRED FOR NEW COURSE PROPOSALS

COMP 3730 – Introduction to Parallel Programming

Course Outline:

- Introduction (1 hour)
 - "Why parallel?", concurrent vs parallel programming, Moore's Law
- Types of parallelism (1 hour)
 - o task, data, instruction and thread-level parallelism, Flynn's taxonomy
- Shared-memory programming (2 hours)
 - Threaded programming, explicit and implicit thread control, trivially parallel algorithms
- Explicit threading (4 hours)
- Synchronization (2 hours)
 - race conditions, mutual exclusion, deadlocks, livelocks, starvation, atomicity
- Synchronization design patterns (3 hours)
 - o divide and conquer, locks, critical sections, semaphores
- Work sharing and load balancing (3 hours)
 - o data distribution, interleaving, task distribution, task time estimation
- Performance and scaling (2 hours)
 - efficiency, speedup, Amdahl's Law, weak scaling, strong scaling, compute vs memory bound computation
- Implicit threading (4 hours)
 - OpenMP
- Memory hierarchy (2 hours)
 - cache coherency, memory optimization, multi-core processors, hyperthreading
- Vectorization (3 hours)
 - single instruction, multiple data, AVX instruction set
- Graphics processing units (2 hours)
 - GPU architecture, memory hierarchy

- CUDA (4 hours)
 - \circ data transfer, threads, blocks, single instruction multiple thread

Proposed Evaluation Scheme:

- Assignments (4) 50%
- Midterm examination (written) 20%
- Final examination (written) 30%

Textbooks:

- J.L. Hennessey & D.A. Patterson, *Computer Architecture: a Quantitative Approach*, 5th Edition, Morgan Kaufmann, 2011.
- C. Lin & L. Snyder, *Principles of Parallel Programming*, Pearson, 2009.
- D.B. Kirk & W.H. Wen-Mei, *Programming Massively Parallel Processors*, Morgan Kaufmann, 2016.

Instructor: Dr. Terrence Tricco

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- \Box New course(s):
- X Amended or deleted course(s): EASC 4171, 4173, 4179
- □ New program(s):
- □ Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council:

COURSE NUMBER AND TITLE

4171 Advanced Seismology

REVISED COURSE NUMBER AND TITLE

4171 Seismic Methods

ABBREVIATED COURSE TITLE

Seismic Methods

RATIONALE

The changes more accurately reflect what is currently taught in the course, and simplify the description to make it more understandable to students. This also broadens the description of topics to better reflect the breadth of utility for the methods covered.

CALENDAR CHANGES

EASC 4171 Seismic Methods examines techniques involved in the acquisition, processing and interpretation of **multichannel** seismic **reflection** data. Introduction to elastic properties of rocks<u>;</u>-**Fintroduction** to advanced processing and interpretation techniques as applied to qualitative and **quantitative evaluation of hydrocarbon reservoir characteristics** for imaging and characterization of subsurface properties from reservoir to global scale. This course has a laboratory component designed to provide hands-on experience with data processing and interpretation.

LH: 3

PR: EASC 4179, 3170

CALENDAR ENTRY AFTER CHANGES

EASC 4171 Seismic Methods examines techniques involved in the acquisition, processing and interpretation of seismic data. Introduction to elastic properties of rocks; introduction to processing and interpretation techniques for imaging and characterization of subsurface properties from reservoir to global scale. This course has a laboratory component to provide hands-on experience with data processing and interpretation.

LH: 3

PR: EASC 4179, 3170

COURSE NUMBER AND TITLE

4173 Advanced Electrical, Electromagnetic and Potential Field Methods

RATIONALE

The changes more accurately reflect what is currently taught in the course, and simplify the description to make it more understandable to students. Added a second path into the course to try to attract some non-majors into the course. Removed pre-requisites that are already required for EASC 4179. Re-written to better align with other fourth year geophysics courses.

CALENDAR CHANGES

examines advanced techniques in electrical and electromagnetic exploration methods including advanced IP, airborne EM surveys, EM and IP modelling, and inversion techniques; advanced methods in gravity and magnetic field exploration techniques including 2 ½ D and 3 D modelling and inversion, map processing techniques, and excess mass determination. EASC 4173 Advanced Electrical, Electromagnetic and Potential Field Methods examines the theory and application of these applied geophysics techniques. Topics include: gravitational and magnetic fields due to distributions of density and magnetization; potential theory, and processing techniques derived from this theory; conservation of charge, Ohm's law and Maxwell's equations for electric and electromagnetic fields in the Earth's subsurface.This course has a laboratory component during which students apply computer modelling and interpretation methods to real-life examples.

LH: 3

PR: EASC 3170, 3172, 4179, and physics 2820; **non-majors who have completed Mathematics 3202 may enroll with permission from the instructor**

CALENDAR ENTRY AFTER CHANGES

EASC 4173 Advanced Electrical, Electromagnetic and Potential Field Methods examines the theory and application of these applied geophysics techniques. Topics include: gravitational and magnetic fields due to distributions of density and magnetization; potential theory, and processing techniques derived from this theory; conservation of charge, Ohm's law and Maxwell's equations for electric and electromagnetic fields in the Earth's subsurface. This course has a laboratory component during which students apply computer modelling and interpretation methods to real-life examples.

LH: 3

PR: EASC 4179; non-majors who have completed Mathematics 3202 may enroll with permission from the instructor

COURSE NUMBER AND TITLE

4179 Digital Signal Processing

REVISED COURSE NUMBER AND TITLE

4179 Signal Processing in Geophysics

ABBREVIATED COURSE TITLE

Signal Processing in GP

RATIONALE

Title change emphasizes application; digital is now understood in signal processing. Pre-requisite change reflect currently available courses and the skills required to succeed in the course. Changes are meant to help make the courses accessible to interested non-majors. Additional text about the lab component added to align with other fourth-year geophysics courses.

CALENDAR CHANGES

EASC 4179 Signal Processing in Geophysics is an introduction to the theory and basic computational techniques of digital signal processing in geophysics. Topics covered include: sampling, Fourier transformation, design and application of digital filters, deconvolution, spectral analysis, <u>and</u> two dimensional signal processing, with emphasis on geophysical applications. <u>This course includes a lab</u> component where students implement and apply various techniques to geophysical data.

LH: 3

PR: EASC 3170, 3172, 3179, and Physics 2820; <u>Non-majors may replace EASC 3179 with</u> <u>Mathematics 3202; Non-majors may replace Physics 2820 with 3 credit hours in Computer</u> <u>Science.</u>

CALENDAR ENTRY AFTER CHANGES

EASC 4179 Signal Processing in Geophysics is an introduction to the theory and basic computational techniques of digital signal processing in geophysics. Topics covered include: sampling, Fourier transformation, design and application of digital filters, deconvolution, spectral analysis, two dimensional signal processing, with emphasis on geophysical applications. This course includes a lab component where students implement and apply various techniques to geophysical data.

LH: 3

PR: EASC 3170, 3172, 3179, and Physics 2820; Non-majors may replace EASC 3179 with Mathematics 3202; Non-majors may replace Physics 2820 with 3 credit hours in Computer Science.

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- X New course(s): EASC 2100 Subsurface geoscience for environmental and humanitarian challenges
- \Box Amended or deleted course(s):
- □ New program(s):
- \Box Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council:

COURSE NUMBER AND TITLE

EASC 2100 Subsurface geoscience for environmental and humanitarian challenges

ABBREVIATED COURSE TITLE

Geosci for env and hum chall

RATIONALE

This course provides an introductory second year course in subsurface geoscience, to bridge and fill the gap between EASC 1000 and the third-year geophysics courses. As this course does not have a lab component, it would also satisfy the demand for follow-up courses to EASC 1000 that are accessible to non-majors but that can also count toward professional accreditation for majors (Professional Engineers and Geoscientists of Newfoundland and Labrador (PEGNL) Geoscience Knowledge Requirement category 2C: Other Sciences/Science – 2nd year level or higher).

CALENDAR CHANGES

EASC 2100 Subsurface Geoscience for Environmental and Humanitarian Challenges introduces students to subsurface methods that can be used for environmental and humanitarian applications such as sourcing the green economy, storing excess carbon, monitoring water resources, documenting past events in human history, tracking present-day military activity, improving urban planning, ensuring integrity of power grids, and terra-forming other planets. Challenges will be addressed through an overview of the relevant subsurface methods (seismic, gravity, magnetics, ground penetrating radar) and their real-world application.

PR: EASC 1000 with a grade of at least 55%

CALENDAR ENTRY AFTER CHANGES

EASC 2100 Subsurface Geoscience for Environmental and Humanitarian Challenges introduces students to subsurface methods that can be used for environmental and humanitarian applications such as sourcing the green economy, storing excess carbon, monitoring water resources, documenting past events in human history, tracking present-day military activity, improving urban planning, ensuring integrity of power grids, and terra-forming other planets. Challenges will be addressed through an overview of the relevant subsurface methods (seismic, gravity, magnetics, ground penetrating radar) and their real-world application.

PR: EASC 1000 with a grade of at least 55%

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

CONSULTATIONS SOUGHT

Academic Unit Response as of Nov 29th Humanities and Social Sciences **Business Administration** Education Yes **Engineering and Applied Science** Yes Human Kinetics and Recreation Medicine Music Nursing Yes Pharmacy Science Social Work

Library

Grenfell Campus Arts and Social Science Science and the Environment Fine Arts

Marine Institute

Labrador Institute Arctic and Subarctic Studies

LIBRARY REPORT

A library consult email was sent Nov. 28, 2022

RESOURCE IMPLICATIONS

The course will be taught by existing EASC faculty.

ADDITIONAL INFORMATION REQUIRED FOR NEW COURSE PROPOSALS

2022_EASC_Calendar_Changes_Consults

medvicedean

Reply all

Tue 11/22/2022 1:19 AM

To:

Morrill, Penny L

Cc:

deanofmedicine@med.mun.ca

Action Items

Dr. Morrill, Thx for the opportunity to review these calendar changes. I have no edits or concerns. Best Dolores

Dolores M McKeen MD FRCPC MSc CCPE Vice Dean | Education & Faculty Affairs Professor | <u>Memorial University of Newfoundland</u> Past President | <u>Canadian Anesthesiologists' Society</u> @dolores_mckeen

Faculty of Medicine

Memorial University of Newfoundland

Faculty of Medicine Building | Rm 2M315 300 Prince Philip Drive

St. John's NL CA A1B 3V6

T: 709 864 6417 | F: 709 864 6336

Davis,Erin

Reply all

Wed 11/23/2022 3:10 PM To: Morrill, Penny L You forwarded this message on 11/28/2022 10:58 AM

Hi Penny,

Thank you for the opportunity to comment on these proposed changes, pharmacy has no concerns and we do not believe these will affect our students or programs.

Erin --Dr. Erin Davis BSc (Pharm), PharmD Associate Dean Undergraduate Studies Associate Professor Memorial University School of Pharmacy T 709 864 8815 E emdavis@mun.ca

Engineering Consult <engrconsult@mun.ca>

Reply all

Wed 11/23/2022 9:08 AM To: Morrill, Penny L Hi,

Thanks for giving us the opportunity to provide feedback on the proposed calendar changes. The Faculty of Engineering and Applied Science Committee on Undergraduate Studies does not anticipate any impact of the proposed changes on engineering programs. Sincerely,

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

Earth Sciences' proposed calendar changes and new course

Morrill, Penny L

 Reply all

 Mon 11/28/2022 10:58 AM

 To:

 Library Correspondence

 Cc:

 J. Kim Welford <kwelford@mun.ca>;

 Miskell, Michelle

 EASC_2022_ProposedUndergraduateCalendarChangesNov_17_2022.pdf451 KB

Download

Nov. 28th, 2022

To whom it may concern,

I'm sorry that this is coming to you so late. In reviewing my consult email list, I see that I had incorrectly entered your email address. Please see the email below.

We are proposing a new course EASC 2100 Subsurface geoscience for environmental and humanitarian challenges, which requires a Library Report.

Thanks,

Penny

--

Penny Morrill, Ph.D. (Pronouns: She/her)

Professor, and Deputy Head (Undergraduate)

Department of Earth Sciences

Memorial University of Newfoundland St. John's, NL A1B 3X5 Canada phone: (709) 864-6729 fax: (709) 864-2589 Webpage: https://www.esd.mun.ca/wordpress/deltasresearch/

I acknowledge that the lands on which Memorial University's campuses are situated are in the traditional territories of diverse Indigenous groups, and acknowledge with respect the diverse histories and cultures of the Beothuk, Mi'kmaq, Innu, and Inuit of this province.

Earth Sciences' proposed calendar changes and new course

Earth Sciences' proposed calendar changes and new course

Morrill, Penny L

Reply all

Mon 11/28/2022 10:58 AM

To:

Library Correspondence

Cc:

J. Kim Welford <kwelford@mun.ca>;

Miskell, Michelle

EASC_2022_ProposedUndergraduateCalendarChangesNov_17_2022.pdf451 KB

Download

Nov. 28th, 2022

Paper 5.A.r. (pages 132-151)

To whom it may concern,

I'm sorry that this is coming to you so late. In reviewing my consult email list, I see that I had incorrectly entered your email address. Please see the email below.

We are proposing a new course EASC 2100 Subsurface geoscience for environmental and humanitarian challenges, which requires a Library Report.

Thanks,

Penny

Penny Morrill, Ph.D. (Pronouns: She/her) Professor, and Deputy Head (Undergraduate) Department of Earth Sciences Memorial University of Newfoundland St. John's, NL A1B 3X5 Canada phone: (709) 864-6729 fax: (709) 864-2589 Webpage: https://www.esd.mun.ca/wordpress/deltasresearch/

I acknowledge that the lands on which Memorial University's campuses are situated are in the traditional territories of diverse Indigenous groups, and acknowledge with respect the diverse histories and cultures of the Beothuk, Mi'kmaq, Innu, and Inuit of this province.

From: Morrill, Penny L [mailto:pmorrill@mun.ca]
Sent: Friday, November 18, 2022 12:36 PM
To: Oldford, Erin <<u>eoldford@mun.ca</u>>; Furey, Edith <<u>efurey@mun.ca</u>>; <u>engrconsult@mun.ca</u>; HKR Dean
<<u>hkrdean@mun.ca</u>>; <u>deanofmedicine@med.mun.ca</u>; Karen Bulmer <<u>kbulmer@mun.ca</u>>; DeanNurse

<<u>DeanNurse@mun.ca</u>>; <u>pharminfo@mun.ca</u>; adeanugradswk <<u>adeanugradswk@mun.ca</u>>; Library Correspondence <<u>univlib@mun.ca</u>>; <u>ipercy@grenfell.mun.ca</u>; <u>ssedean@grenfell.mun.ca</u>; <u>thennessey@grenfell.mun.ca</u>; <u>miugconsultations@mi.mun.ca</u>; Ashlee Cunsolo <<u>ashlee.cunsolo@mun.ca</u>>; Oldford, Erin <<u>eoldford@mun.ca</u>> **Subject:** Earth Sciences' proposed calendar changes and new course

Nov. 18, 2022

Hello,

I am writing to extend an opportunity for feedback on the attached calendar change proposals:

EASC 4171 Advanced Seismology,

EASC 4173 Advanced Electrical, Electromagnetic and Potential Field Methods,

EASC 4179 4179 Digital Signal Processing,

and a new course proposal:

EASC 2100 Subsurface geoscience for environmental and humanitarian challenges.

Please send your comments to pmorrill@mun.ca.

Please share this information with members other unit's undergraduate committees.

Thank you for your time.

Cheers,

Penny

Morrill, Penny L

Reply all
ri 11/18/2022 12:36 PM
0:
Idford, Erin;
urey, Edith;
ngrconsult@mun.ca;
IKR Dean;
eanofmedicine@med.mun.ca;
aren Bulmer;
JeanNurse;
harminfo@mun.ca;
deanugradswk;
ibrary Correspondence;
percy@grenfell.mun.ca;
sedean@grenfell.mun.ca;
nennessey@grenfell.mun.ca;
niugconsultations@mi.mun.ca;
shlee Cunsolo

EASC_2022_ProposedUndergraduateCalendarChangesNov_17_2022.pdf451 KB

Download

Nov. 18, 2022

Hello,

I am writing to extend an opportunity for feedback on the attached calendar change proposals:

EASC 4171 Advanced Seismology,

EASC 4173 Advanced Electrical, Electromagnetic and Potential Field Methods,

EASC 4179 4179 Digital Signal Processing,

and a new course proposal:

EASC 2100 Subsurface geoscience for environmental and humanitarian challenges.

Please send your comments to pmorrill@mun.ca.

Please share this information with members other unit's undergraduate committees.

Thank you for your time.

Cheers,

Penny

Morrill, Penny L

Reply all Today, 12:36 PM Oldford, Erin; Furey, Edith; engrconsult@mun.ca; HKR Dean;

deanofmedicine@med.mun.ca;

Karen Bulmer;

DeanNurse;

pharminfo@mun.ca;

adeanugradswk;

Library Correspondence;

+6 more

EASC_2022_ProposedUndergraduateCalendarChangesNov_17_2022.pdf451 KB

Download

Nov. 18, 2022

Hello,

I am writing to extend an opportunity for feedback on the attached calendar change proposals:

EASC 4171 Advanced Seismology,

EASC 4173 Advanced Electrical, Electromagnetic and Potential Field Methods,

EASC 4179 4179 Digital Signal Processing,

and a new course proposal:

EASC 2100 Subsurface geoscience for environmental and humanitarian challenges.

Please send your comments to pmorrill@mun.ca.

Please share this information with members other unit's undergraduate committees.

Thank you for your time.

Cheers,

Penny

--

Penny Morrill, Ph.D. (Pronouns: She/her) Professor, and Deputy Head (Undergraduate) Department of Earth Sciences Memorial University of Newfoundland St. John's, NL A1B 3X5 Canada phone: (709) 864-6729 fax: (709) 864-2589 Webpage: https://www.esd.mun.ca/wordpress/deltasresearch/

Consultation for Earth Sciences' Calendar Changes and New Course Proposal

Frew, Rose Mary

Reply all

Yesterday, 6:40 PM

Morrill, Penny L
Inbox

To help protect your privacy, some content in this message has been blocked. To re-enable the blocked features, click here.

To always show content from this sender, click here.

I have forwarded to the Associate Dean (Curriculum and Programs), Dr. Shannon Hoff, for review.

Best regards,

Rose

Rose Frew Telephone: (709) 864-8255 Email: <u>rmfrew@mun.ca</u> Administrative Support to Associate Deans: Dr. Liam Swiss; Dr. Shannon Hoff Faculty of Humanities and Social Sciences

Consultation for Earth Sciences' Calendar Changes and New Course Proposal

Morrill, Penny L

Today, 11:39 AM

-- Penny Morrill, Ph.D. (Pronouns: She/her) Professor, and Deputy Head (Undergraduate) Department of Earth Sciences Memorial University of Newfoundland St. John's, NL A1B 3X5 Canada phone: (709) 864-6729 fax: (709) 864-2589 Webpage: https://www.esd.mun.ca/wordpress/deltasresearch/

deansciassistant

Reply all

Today, 8:16 AM

BiocDHundergrad;

Paper 5.A.r. (pages 132-151)

Biology Acaden	nic Program Offic	cer;	
Charles Mather	<cmather@mun< td=""><td>.ca>;</td><td></td></cmather@mun<>	.ca>;	
CS General;			
Department of	Chemistry Consu	lt;	
Hunt, Donna M	.,		
Gagnon, Patrick;			
Goulding, Rick;			
+13 more			
You forwarded	this message on	11/15/2022 11:3	9 AM
EASC4171- Senate- Summary- Page- Courses_final	EASC4173- Senate- Summary- Page- Courses_final.	EASC4179- Senate- Summary- Page- Courses_final.	UCCPF- Package_EASC2100_SubsurfaceGeoscienceEnvironmentalH umanitarian_final.pdf127 KB
.pdf99 KB	pdf107 KB	pdf105 KB	

4 attachments (438 KB) Download all

From: Morrill, Penny L <pmorrill@mun.ca>
Sent: Sunday, November 13, 2022 8:10 PM
To: deansciassistant <deansciassistant@mun.ca>
Cc: Miskell, Michelle <mmiskell@mun.ca>
Subject: Consultation for Earth Sciences' Calendar Changes and New Course Proposal

Nov. 13, 2022

Hello,

I am writing to extend an opportunity for feedback on the attached calendar change proposals:

EASC 4171 Advanced Seismology,

EASC 4173 Advanced Electrical, Electromagnetic and Potential Field Methods,

EASC 4179 4179 Digital Signal Processing,

and a new course proposal:

EASC 2100 Subsurface geoscience for environmental and humanitarian challenges).

Please send your comments to pmorrill@mun.ca.

Please share this information with members other unit's undergraduate committees.

Thank you for your time.

Cheers,

Penny

--

Penny Morrill, Ph.D. (Pronouns: She/her) Professor, and Deputy Head (Undergraduate) Department of Earth Sciences Memorial University of Newfoundland St. John's, NL A1B 3X5 Canada phone: (709) 864-6729 fax: (709) 864-2589

Webpage: https://www.esd.mun.ca/wordpress/deltasresearch/

I acknowledge that the lands on which Memorial University's campuses are situated are in the traditional territories of diverse Indigenous groups, and acknowledge with respect the diverse histories and cultures of the Beothuk, Mi'kmaq, Innu, and Inuit of this province.

123

Consultation for Earth Sciences' Calendar Changes and New Course Proposal

Morrill, Penny L

Reply all			
Today, 8:10 PM			
deansciassistan	ıt;		
Miskell, Michel	le		
EASC4171- Senate-	EASC4173- Senate-	EASC4179-	
Summary-	Summary-	Summary-	UCCPF- Package FASC2100 SubsurfaceGeoscienceEnvironmentalH
Page-	Page-	Page-	umanitarian final.pdf127 KB
Courses_final	Courses_final.	Courses_final.	- '
.pdf99 KB	pdf107 KB	pdf105 KB	

Show all 4 attachments (438 KB) Download all

Nov. 13, 2022

Hello,

I am writing to extend an opportunity for feedback on the attached calendar change proposals:

EASC 4171 Advanced Seismology, EASC 4173 Advanced Electrical, Electromagnetic and Potential Field Methods, EASC 4179 4179 Digital Signal Processing,

and a new course proposal:

EASC 2100 Subsurface geoscience for environmental and humanitarian challenges).

Please send your comments to pmorrill@mun.ca.

Please share this information with members other unit's undergraduate committees.

Thank you for your time.

Cheers, Penny

Penny Morrill, Ph.D. (Pronouns: She/her) Professor, and Deputy Head (Undergraduate) Department of Earth Sciences Memorial University of Newfoundland St. John's, NL A1B 3X5 Canada phone: (709) 864-6729 fax: (709) 864-2589

Webpage: https://www.esd.mun.ca/wordpress/deltasresearch/

I acknowledge that the lands on which Memorial University's campuses are situated are in the traditional territories of diverse Indigenous groups, and acknowledge with respect the diverse histories and cultures of the Beothuk, Mi'kmaq, Innu, and Inuit of this province.

Course outline: EASC 2100 Subsurface Geoscience for Environmental and Humanitarian Challenges

Learning outcomes: To gain a basic understanding of subsurface geoscientific methods that can be used for environmental and humanitarian applications such as sourcing the green economy, storing excess carbon, monitoring water resources, documenting past events in human history, tracking present-day military activity, improving urban planning, ensuring integrity of power grids, and terra-forming other planets. Challenges will be addressed through an overview of the relevant subsurface methods (seismic, gravity, magnetics, ground penetrating radar) and their real-world application.

Topics covered: This course will be structured around key environmental and humanitarian challenges, through an overview of the relevant subsurface geoscientific approaches (seismic, gravity, magnetics, ground penetrating radar) and their real-world application. Topics will include:

- 1) Sourcing the green economy
 - a. What mineral resources do we need to build batteries, solar panels, wind turbines?
 - b. Can we remotely detect these resources in the subsurface and extract them sustainably?
- 2) Storing excess carbon
 - a. Why do we need to store excess carbon?
 - b. What carbon sinks are available?
 - c. How do we find and monitor these storage sites?
- 3) Monitoring water resources
 - a. How do we differentiate between saline and fresh water?
 - b. Can we detect water contaminants remotely?
 - c. How can we detect and monitor subsurface water resources?
- 4) Documenting past events in human history
 - a. What kinds of subsurface features document past events in human history (e.g., wars, residential schools)?
 - b. Can we detect and confidently assess these features?
- 5) Tracking present-day military activity
 - a. Can we remotely monitor present-day military activity?
 - b. Can we differentiate between natural earthquakes and nuclear bomb tests?
- 6) Improving urban planning
 - a. In what ways does urban planning depend on our knowledge of the subsurface?
 - b. How can this knowledge mitigate current problems in urban environments?
 - c. Can we use subsurface methods to monitor and learn about the built environment?
- 7) Ensuring integrity of power grids
 - a. What is needed for a reliable large-scale power distribution network?

- b. Can we guard against surges and blackouts of the electricity network?
- 8) Terra-forming other planets
 - a. What resources do we need to terra-form other planets?
 - b. Can we remotely assess the availability of such resources?

Instruction method: Classes will involve both formal lectures and hands-on experiments and assignments since there is no formal lab period.

Resources: The textbook *Looking into the Earth: An Introduction to Geological Geophysics* by Mussett and Aftab Khan (full citation below), as well as formal lecture notes prepared by the instructor(s).

Prerequisite: EASC 1000 with a grade of at least 55%

Class participation: Students are expected to attend lectures and actively participate in class activities and discussions, both in-person and on course-related online discussion boards. Students will be evaluated based on their participation.

Assignments: Students will be assigned take-home assignments, such as fill-in the blank sheets and short popular science articles, throughout the semester to encourage them to seek out a range of opinions on the topics under discussion.

Multi-media presentations: Students will be tasked with creating multi-media presentations on the topics covered and on how these topics are presented in the media.

Exams: There will be a midterm exam, worth 15% of the final grade, and a final exam, worth 25% of the final grade.

Assessment

class participation	10%
assignments	20%
multi-media presentations	30%
midterm exam	15%
final exam	25%

Textbook: Mussett, A.E., and Aftab Khan, M. 2000. *Looking into the Earth: An Introduction to Geological Geophysics*. Cambridge, UK: Cambridge University Press.

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

□ New course(s):

✓ Amended or deleted course(s): Physics 2750

- New program(s):
- □ Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council:

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

COURSE NUMBER AND TITLE

Physics 2750 Modern Physics

RATIONALE

We would like to reintroduce a laboratory component to Physics 2750, a course that introduces students to the two key advances that revolutionized physics beyond classical Newtonian physics: quantum physics and relativity. The labs will make tangible some of the fundamental concepts introduced in the course. Adding the lab is in line with MUN's focus on experiential learning. The proposal follows a recommendation from our last Academic Program Review to bring PHYS 2750 more in line with similar courses in Canada and aligns with our Departmental Strategic Plan to invigorate experimental and laboratory curriculum components.

This course used to have a lab component, but it was streamlined out of the course over 16 years ago. Grenfell's equivalent offering of the course still has a lab component. Recent departmental efforts have made second year labs less burdensome for students. The labs will provide what many physicists fondly recall as their most memorable moments in undergraduate physics, such as the Millikan oil drop experiment, which demonstrates that charge is a discrete quantity.

This proposal will advance realignment of physics course offerings between St. John's and Grenfell campuses.

CALENDAR CHANGES

2750 Modern Physics explores the fundamental ideas that are still driving technological developments. Einstein's theory of special relativity, and the microscopic world described by quantum physics are introduced through crucial historical observations. The course covers the dual nature of light and particles, quantum well and quantum tunneling phenomena, which play a key role in <u>modern modern</u> electronics. Atomic and nuclear structure, and elementary particles are also described.

CO: Mathematics 1001; PHYS 1051

LH: 3 CR: PHYS 2056 PR: Mathematics 1001; PHYS 1051 (or PHYS 1021 with a minimum grade of 70%)

CALENDAR ENTRY AFTER CHANGES

2750 Modern Physics explores the fundamental ideas that are still driving technological developments. Einstein's theory of special relativity, and the microscopic world described by quantum physics are introduced through crucial historical observations. The course covers the dual nature of light and particles, quantum well and quantum tunneling phenomena, which play a key role in modern electronics. Atomic and nuclear structure, and elementary particles are also described.

CO: Mathematics 1001; PHYS 1051

LH: 3

CR: PHYS 2056

PR: Mathematics 1001; PHYS 1051 (or PHYS 1021 with a minimum grade of 70%)

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

CONSULTATIONS SOUGHT

Text of consultation:

The Department of Physics and Physical Oceanography seeks consultation on the reintroduction of a laboratory component to Physics 2750 Modern Physics. The labs will allow students to uncover for themselves phenomena that revolutionized physics beyond the Newtonian paradigm.

Please sent replies to saika@mun.ca

Sincerely, Ivan

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

Sent to/Replies received:

Humanities and Social Scienceshss@mun.caBusiness Administrationeoldford@mun.caEducationefurey@mun.caEngineering and Applied Scienceengrconsult@mun.ca

From: Engineering Consult <engrconsult@mun.ca> Subject: Re: Proposal for Physics 2750 Modern Physics Date: November 23, 2022 at 9:11:40 AM NST To: Ivan Saika-Voivod <saika@mun.ca>

Hi,

Thanks for giving us the opportunity to provide feedback on the proposed calendar changes. The Faculty of Engineering and Applied Science Committee on Undergraduate Studies does not anticipate any impact of the proposed changes on engineering programs. The Committee is appreciative of the effort to add the laboratory component to the course. We believe students will appreciate the addition. Sincerely,

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

Human Kinetics and Recreationhkrdean@mun.caMedicinedeanofmedicine@med.mun.ca

From: medvicedean <medvicedean@mun.ca> Subject: Re: Proposal for Physics 2750 Modern Physics Date: November 29, 2022 at 1:35:33 AM NST To: "saika@mun.ca" <saika@mun.ca> Cc: "DeanofMedicine@med.mun.ca" <DeanofMedicine@med.mun.ca>

Dr. Saika-Voivod,

Thank you for the opportunity to review the proposed reintroduction of the laboratory component to Physics 2750 Modern Physics and exploration of quantum physics and relativity. The Faculty of Medicine does not have any comments or concerns. Best Dolores McKeen

Dolores M McKeen MD FRCPC MSc CCPE Vice Dean | Education & Faculty Affairs Professor | Memorial University of Newfoundland Past President | Canadian Anesthesiologists' Society @dolores_mckeen

Faculty of Medicine Memorial University of Newfoundland Faculty of Medicine Building | Rm 2M315 300 Prince Philip Drive St. John's NL CA A1B 3V6 T: 709 864 6417 | F: 709 864 6336

Music	kbulmer@mun.ca
Nursing	deanNurse@mun.ca
Pharmacy	pharminfo@mun.ca

From: "Davis,Erin" <emdavis@mun.ca> Subject: FW: Proposal for Physics 2750 Modern Physics Date: November 23, 2022 at 12:44:23 PM NST To: "saika@mun.ca" <saika@mun.ca>

Hello Ivan,

Thank you for the opportunity to comment on the proposed change, pharmacy has no concerns with the proposal and we do not believe this will affect our programs or students.

Erin

Dr. Erin Davis BSc (Pharm), PharmD Associate Dean Undergraduate Studies Associate Professor Memorial University School of Pharmacy T 709 864 8815 E emdavis@mun.ca

Science Social Work Library	deansci@mun.ca adeanugradswk@mun.ca univlib@mun.ca
Grenfell Campus Arts and Social Science Science and the Environment Fine Arts	kjacobse@grenfell.mun.ca ssedean@grenfell.mun.ca thennessey@grenfell.mun.ca
Marine Institute	miugconsultations@mi.mun.ca
Labrador Institute Arctic and Subarctic Studies	ashlee.cunsolo@mun.ca

RESOURCE IMPLICATIONS

This proposal would benefit from additional resources. However, adding a lab to PHYS 2750 is an important change and we will find the 20 to 30 hours of additional staff and/or faculty time required for the labs by reallocating existing resources.

Lab staff time is the largest limitation to having labs in PHYS 2750. This was a contributing factor to removing the lab component in the first place. Our aim is to work within limitations of lab staff time. This means that we will initially limit the number of lab exercises in PHYS 2750 to no more than three. This allows lab exercises to be completed over two lab periods, allowing more hands-on exploration by students.

To further help address resource constraints, we will reduce the number of labs in PHYS 2055, which is taught in the same semester as PHYS 2750, allowing for biweekly labs for PHYS 2055 and PHYS 2750 to take place in alternating weeks (while sharing a common introductory session).

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- X New course(s): CHEM 4432
- \Box Amended or deleted course(s):
- □ New program(s):
- \Box Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council: _____

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

COURSE NUMBER AND TITLE

CHEM 4432 C-H Functionalization

ABBREVIATED TITLE

C–H Functionalization

RATIONALE

In keeping with the modern trends in synthetic chemistry, this course aims to introduce the growing field of C–H activation/functionalization chemistry. This course will explore the fundamental concepts and modern methodological advancements in C–H functionalization research with an emphasis on metal catalyzed/mediated processes, radical chemistry, and photocatalysis in synthetic chemistry.

This course exists already as a Special Topics Graduate course, CHEM 6493. The intent is to offer this course for undergraduate students as well, without requiring special sign-in permissions, such that it would meet the requirements of a 4000-level course for Honours students without using a course substitution.

CALENDAR CHANGES

4432 C-H Functionalization explores the fundamental concepts and modern methodological advancements in C–H functionalization research with an emphasis on metal catalyzed/mediated processes, radical chemistry, and photocatalysis in synthetic chemistry. This course will include (but is not limited to): catalytic cycles, historically relevant research findings, new synthetic approaches, mechanistic observations/understandings, and applications of the described synthetic processes. PR: CHEM 3411

CALENDAR ENTRY AFTER CHANGES

4432 C-H Functionalization explores the fundamental concepts and modern methodological advancements in C–H functionalization research with an emphasis on metal catalyzed/mediated processes, radical chemistry, and photocatalysis in synthetic chemistry. This course will include (but is not limited to): catalytic cycles, historically relevant research findings, new synthetic approaches, mechanistic observations/understandings, and applications of the described synthetic processes.

PR: CHEM 3411

SECONDARY CALENDAR CHANGES

Nil

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

CONSULTATIONS SOUGHT

Academic Unit	Response Received
Humanities and Social Sciences	
Business Administration	
Education	
Engineering and Applied Science	
Human Kinetics and Recreation	
Marine Institute	
Medicine	
Music	
Nursing	
Pharmacy	
Science	
Biochemistry	
Biology	
Computer Science	
Earth Sciences	
Mathematics and Statistics	
Ocean Sciences	
Office of the Dean	
Physics and Physical Oceanography	
Psychology	
Social Work	
Library	
Grenfell - Arts and Social Science	
Grenfell - Science and the Environment	
Grenfell - Fine Arts	

RESOURCE IMPLICATIONS

Nil

ADDITIONAL INFORMATION REQUIRED FOR NEW COURSE PROPOSALS

Chem 4432: C–H Functionalization

Term/Year

Instructor Information

Instructor Dr. Huck Grover

Email hgrover@mun.ca Office Location and Hours CSF 3329, Time, Days

General Information Lecture Times: Labs: Tutorial:

3 lecture hours / week NO LABS are associated with this course OPTIONAL (~ 1 every 3 weeks)

Course Description:

In keeping with the modern trends in synthetic chemistry, this course aims to introduce the growing field of C–H activation/functionalization chemistry. In this course we will explore fundamental concepts and modern methodological advancements in C–H functionalization research with an emphasis on metal catalyzed/mediated processes, radical chemistry, and photocatalysis in synthetic chemistry. Topics will include (but are not limited to): catalytic cycles, historically relevant research findings, new synthetic approaches, mechanistic observations/understandings, and applications of the described synthetic processes.

Course Material and Resources

Texts (no textbook is required for this course)

Recommended textbooks on this subject:

- Li, J. J. C–H Bond Activation in Organic Synthesis. Taylor & Francis Group. 2015.
- Zard, S. Z. Radical Reactions in Organic Synthesis. Oxford University Press. 2004.
- Stephenson, C. Yoon, T. MacMillan, D. Visible Light Photocatalysis in Organic Chemistry. Wiley, 2018.

Current Literature:

Much of the reading assigned in this class will come from the primary literature. Journals particularly relevant to this area of chemistry include:

- Science
- Nature Chemistry
- Journal of the American Chemical Society

10% 45% 45% 100%



Evaluation

Your performance in this course will be evaluated by the following scheme:		
Participation		
Assignments/presentations		
Midterm/Final Exams		

Total Evaluation

<u>Evaluation notes</u>: (1) Participation is based on active discussions during lecture and peer presentations, problem solving, and in class group work. (2) Midterm and final exams – 6000 level will be approximately double the length of 4000 level. (3) Assignments and presentations - the details will be discussed during class and instructions will be posted on Brightspace. (4) Full details of course evaluations will be discussed during class the first class.

Course Topics (Tentative)			
Metal Catalyzed/Mediated C-H Functionalization:			
 Review Traditional Coupling Mechanism 	Nickel		
Overview of Directing Groups	• Iron		
Palladium	• Copper		
Rhodium	Cobalt		
Radical-Mediated Reactions:			
General Concepts	Stannane Chemistry		
 Hofmann-Loffler-Freytag 	Organo-silicon		
Radical Activators	Barton reactions		
Chain Reactions	 Atom and group transfer reactions 		
Visible Light Photocatalysis in Organic Chemistry:			
General Overview	Amino C-H functionalization		
Bond Cleavage	Cycloadditions		
Bond Formation	Arene Functionalization		
 Atom and group transfer reactions 	 Photoredox with transition metal 		
	catalysis		

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- \Box New course(s):
- x Amended or deleted course(s): Biology 3709
- □ New program(s):
- x Amended or deleted program(s): Majors/Honours in Oceans Sciences and Joint Major/Honours in Marine Biology
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council:

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Programs

PROGRAM TITLES

BSc with Joint Major in Marine Biology BSc with Joint Honours in Marine Biology BSc with Major in Ocean Sciences BSc with Major in Ocean Sciences (Environmental Systems) BSc with Honours in Ocean Sciences

RATIONALE

We wish to add Biology 3709 (Field Course in Marine Principles and Techniques) to the list of possible choices students have to fulfill the minimum requirement for hands-on training in marine science techniques in the above-listed programs. Currently, this requirement can be fulfilled by taking OCSC 2500 (Introduction to Practical Ocean Sciences) or OCSC 4500 (same as Biology 4710, Experimental Marine Ecology). After reviewing the syllabus of Biology 3709 and consulting with Biology, we found it to be another suitable substitute. Adding it to the list will help make program requirements more easily fulfilled by students, since enrolments are growing and field/hands-on courses can only accommodate few students each semester. Biology 3709 is offered in an intensive format at Bonne Bay and is sufficiently different from OCSC 2500 and 4500 as to not require cross listing or credit restriction, helping students access more hands-on courses. A minor secondary change to the description of Biology 3709 is also proposed to align with the program maps/timing.

Changes to Joint Major in Marine Biology (marked)

10.1.13.2 Program of Study

Students pursuing a Joint Major in Marine Biology are required to complete a minimum of 60 combined credit hours from Biology and Ocean Sciences, with a minimum of 27 credit hours in each subject:

- Six credit hours in <u>Critical Reading and Writing (CRW)</u> courses, including at least 3 credit hours in English courses;
- 2. Mathematics 1000;
- 3. Earth Sciences 1000;
- 4. Statistics 2550 or any of the courses listed in the credit restrictions of Statistics 2550;
- 5. Physics 1020 and 1021 (or 1050 and 1051);
- 6. Chemistry 1050 and 1051 (or 1200 and 1001), and 2400 and 2401;
- 7. Biochemistry 2201 or the former 2101;
- Biology 1001, 1002, 2060, 2122, 2250 (or Biochemistry 2100), 2600, 2900, 3710 (or Ocean Sciences 2000) and 3711;
- Ocean Sciences 1000, 2000 (or Biology 3710), 2001, 2100, and at least one of 2500 or 4500 (or Biology <u>3709 or</u> 4710);

- additional courses to complete the required 60 combined credit hours in Biology and Ocean Sciences with a minimum of 27 credit hours in each subject (except Biology 2040, 2041, 2120, 3053, and 3820). A minimum of 6 credit hours in Biology at the 3000/4000 level and 12 credit hours in Ocean Sciences at the 3000/4000 level is required; and
- 11. other courses as necessary to complete the minimum of 120 credit hours required for the General Degree of Bachelor of Science.

Changes to Joint Honours in Marine Biology (marked)

10.2.21 Marine Biology Joint Honours

The program is jointly administered by the Department of Ocean Sciences and the Department of Biology. To be eligible for admission, students would normally follow the requirements for the <u>Joint Major in Marine</u> <u>Biology</u>. Specifically, students must have successfully completed Biology 2060, 2250, 2600, and 2900 and Ocean Sciences 2000 (or Biology 3710), 2001, 2100 and 2300 and obtained in these courses a grade of "B" or better, or an average of 75% or higher. Selection is based on academic performance in the required courses.

Students who wish to be admitted to this programs must submit an "<u>Application for Admission to Honours</u> <u>Program Faculties of Humanities and Social Sciences or Science</u>" to the Department of Biology and the Department of Ocean Sciences.

The following courses will be required:

- Six credit hours in <u>Critical Reading and Writing (CRW)</u> courses, including at least 3 credit hours in English courses;
- 2. Mathematics 1000;
- 3. Earth Sciences 1000;
- 4. Statistics 2550 or any of the courses listed in the credit restrictions of Statistics 2550;
- 5. Physics 1020 and 1021 (or 1050 and 1051);
- 6. Chemistry 1050 and 1051 (or Chemistry 1200 and 1001), and Chemistry 2400 and 2401;
- 7. Biochemistry 2201 or the former 2101;
- Biology 1001, 1002, 2060, 2122, 2250 (or Biochemistry 2100), 2600, 2900, 3710 (or Ocean Sciences 2000) and 3711;
- Ocean Sciences 1000, 2000 (or Biology 3710), 2001, 2100, 2300 and at least one of 2500 or 4500 (or Biology 3709 or 4710);
- 10. Additional courses to complete a required 69 combined credit hours in Biology and Ocean Sciences with a minimum of 30 credit hours in either subject (except Biology 2040, 2041, 2120, 3053, and 3820). A minimum of 9 credit hours in Biology at the 3000/4000 level and 15 credit hours in Ocean Sciences at the 3000/4000 level is required;
- 11. Either Biology 499A and 499B or Ocean Sciences 499A and 499B; and
- 12. A sufficient number of elective courses to bring the degree total to 120 credit hours.

Courses cross listed between Biology and Ocean Sciences can only count for one subject or the other. A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

Changes to Majors and Honours in Ocean Sciences (marked)

11.9.3.2 Program Regulations for the Major in Ocean Sciences

Students must successfully complete:

- the 30 specified credit hours required under <u>Admission Requirements for the Major in Ocean</u> <u>Sciences or the Major in Ocean Sciences (Environmental Systems)</u>;
- 2. Statistics 2550 or any of the courses listed in the credit restrictions of Statistics 2550;
- 3. Physics 1021 or 1051;

- 4. a minimum of 30 credit hours in Ocean Sciences, including:
 - a. Ocean Sciences 2000 (or Biology 3710), 2001, 2100 and at least one of 2500 or 4500 (or Biology 2709 or 4710). Ocean Sciences 1000, successfully completed under <u>Admission</u> <u>Requirements for the Major in Ocean Sciences or the Major in Ocean Sciences</u> <u>(Environmental Systems)</u>, will count as 3 of the required 30 credit hours in Ocean Sciences;
 - b. at least one of Ocean Sciences 2200 or 2300; and
 - c. at least 9 credit hours in Ocean Sciences courses at the 3000 and/or 4000 level.
- extra Science courses as necessary to fulfil the minimum requirement for 78 credit hours in Science as stipulated under <u>Electives</u> of the <u>Degree Regulations</u> for the General Degree of Bachelor of Science. The program should include a minimum of 15 credit hours in Science courses at the 3000 and/or 4000 level; and
- 6. elective courses as necessary to make up the total of 120 credit hours.

11.9.3.3 Program Regulations for the Major in Ocean Sciences (Environmental Systems)

Students must successfully complete:

- 1. the 30 credit hours required under <u>Admission Requirements for the Major in Ocean Sciences</u> <u>or the Major in Ocean Sciences (Environmental Systems)</u>;
- 2. Statistics 2550 or any of the courses listed in the credit restrictions of Statistics 2550;
- 3. Physics 1021 or 1051;
- 4. Geography 1050, and at least two of Geography 2102, 2195, or 2425;
- 5. Earth Sciences 1002, 2502;
- 6. at least 9 credit hours at the 3000 and/or 4000 level chosen from:
 - a. Geography 3120, 3140, 3250, 3425, 3510, 4050, 4060, 4190, 4250, 4917; and
 b. Earth Sciences 3600, 4605, 4903.
- 7. a minimum of 30 credit hours in Ocean Sciences, including:
 - a. Ocean Sciences 2000 (or Biology 3710), 2001, 2100 and at least one of 2500 or 4500 (or Biology 3709 or 4710). Ocean Sciences 1000, successfully completed under <u>Admission</u> <u>Requirements for the Major in Ocean Sciences or the Major in Ocean Sciences</u> (<u>Environmental Systems)</u>, will count as 3 of the required 30 credit hours in Ocean Sciences;
 - b. at least 9 credit hours in Ocean Sciences courses at the 3000 and/or 4000 level.
- 8. elective courses as necessary to make up the total of 120 credit hours.

11.9.4.2 Program Regulations for the Honours in Ocean Sciences

Students must successfully complete:

- 1. the 30 credit hours required under <u>Admission Requirements for the Major in Ocean Sciences</u> or the Major in Ocean Sciences (Environmental Systems);
- Chemistry 2400 (or equivalent). Chemistry 2440 will be accepted as a substitute for Chemistry 2400. However, a number of advanced Science courses may require Chemistry 2400 and 2401. Students are therefore strongly encouraged to successfully complete the Chemistry 2400/2401 sequence or otherwise carefully plan their options;
- 3. Physics 1021 or 1051;
- 4. Statistics 2550 or any of the courses listed in the credit restrictions of Statistics 2550;
- 5. a minimum of 12 credit hours chosen from:
 - a. Biology 2060, 2122, 2250, 2600, 2900;
 - b. Biochemistry 2100, 2201 or the former 2101, 3206 or 3106, 3207 or 3107, 3108;
- 6. a minimum of 45 credit hours in Ocean Sciences, including:
 - Ocean Sciences 2000 (or Biology 3710), 2001, 2100, 2200, 2300 and at least one of 2500 or 4500 (or Biology 3709 or 4710). Ocean Sciences 1000, successfully completed under Admission Requirements for the Major in Ocean Sciences or the Major in

<u>Ocean Sciences (Environmental Systems)</u>, will count as 3 of the required 45 credit hours in Ocean Sciences;

- b. at least 18 credit hours in Ocean Sciences courses at the 3000 and/or 4000 level.
- c. Ocean Sciences 499A/B; and
- 7. elective courses as necessary to make up the total of 120 credit hours including a minimum of 15 credit hours at the 3000 and/or 4000 level in any of Biochemistry, Biology, Chemistry, Earth Sciences, Environmental Science, Geography, Ocean Sciences or Physics (these 15 credit hours can include courses completed as part of the requirements in 5.b. but not those required as part of 6. above).

Changes to Joint Major in Marine Biology (clean)

10.1.13.2 Program of Study

Students pursuing a Joint Major in Marine Biology are required to complete a minimum of 60 combined credit hours from Biology and Ocean Sciences, with a minimum of 27 credit hours in each subject:

- Six credit hours in <u>Critical Reading and Writing (CRW)</u> courses, including at least 3 credit hours in English courses;
- 13. Mathematics 1000;
- 14. Earth Sciences 1000;
- 15. Statistics 2550 or any of the courses listed in the credit restrictions of Statistics 2550;
- 16. Physics 1020 and 1021 (or 1050 and 1051);
- 17. Chemistry 1050 and 1051 (or 1200 and 1001), and 2400 and 2401;
- 18. Biochemistry 2201 or the former 2101;
- 19. Biology 1001, 1002, 2060, 2122, 2250 (or Biochemistry 2100), 2600, 2900, 3710 (or Ocean Sciences 2000) and 3711;
- Ocean Sciences 1000, 2000 (or Biology 3710), 2001, 2100, and at least one of 2500 or 4500 (or Biology 3709 or 4710);
- additional courses to complete the required 60 combined credit hours in Biology and Ocean Sciences with a minimum of 27 credit hours in each subject (except Biology 2040, 2041, 2120, 3053, and 3820). A minimum of 6 credit hours in Biology at the 3000/4000 level and 12 credit hours in Ocean Sciences at the 3000/4000 level is required; and
- 22. other courses as necessary to complete the minimum of 120 credit hours required for the General Degree of Bachelor of Science.

Changes to joint Honours in Marine Biology (clean)

10.2.21 Marine Biology Joint Honours

The program is jointly administered by the Department of Ocean Sciences and the Department of Biology. To be eligible for admission, students would normally follow the requirements for the <u>Joint Major in Marine Biology</u>. Specifically, students must have successfully completed Biology 2060, 2250, 2600, and 2900 and Ocean Sciences 2000 (or Biology 3710), 2001, 2100 and 2300 and obtained in these courses a grade of "B" or better, or an average of 75% or higher. Selection is based on academic performance in the required courses.

Students who wish to be admitted to this programs must submit an "<u>Application for Admission to Honours</u> <u>Program Faculties of Humanities and Social Sciences or Science</u>" to the Department of Biology and the Department of Ocean Sciences.

The following courses will be required:

- Six credit hours in <u>Critical Reading and Writing (CRW)</u> courses, including at least 3 credit hours in English courses;
- 14. Mathematics 1000;
- 15. Earth Sciences 1000;
- 16. Statistics 2550 or any of the courses listed in the credit restrictions of Statistics 2550;
- 17. Physics 1020 and 1021 (or 1050 and 1051);

- 18. Chemistry 1050 and 1051 (or Chemistry 1200 and 1001), and Chemistry 2400 and 2401;
- 19. Biochemistry 2201 or the former 2101;
- 20. Biology 1001, 1002, 2060, 2122, 2250 (or Biochemistry 2100), 2600, 2900, 3710 (or Ocean Sciences 2000) and 3711;
- 21. Ocean Sciences 1000, 2000 (or Biology 3710), 2001, 2100, 2300 and at least one of 2500 or 4500 (or Biology 3709 or 4710);
- 22. Additional courses to complete a required 69 combined credit hours in Biology and Ocean Sciences with a minimum of 30 credit hours in either subject (except Biology 2040, 2041, 2120, 3053, and 3820). A minimum of 9 credit hours in Biology at the 3000/4000 level and 15 credit hours in Ocean Sciences at the 3000/4000 level is required;
- 23. Either Biology 499A and 499B or Ocean Sciences 499A and 499B; and
- 24. A sufficient number of elective courses to bring the degree total to 120 credit hours.

Courses cross listed between Biology and Ocean Sciences can only count for one subject or the other. A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

Changes to Majors and Honours in Ocean Sciences (clean)

11.9.3.2 Program Regulations for the Major in Ocean Sciences

Students must successfully complete:

- the 30 specified credit hours required under <u>Admission Requirements for the Major in Ocean</u> <u>Sciences or the Major in Ocean Sciences (Environmental Systems)</u>;
- 8. Statistics 2550 or any of the courses listed in the credit restrictions of Statistics 2550;
- 9. Physics 1021 or 1051;
- 10. a minimum of 30 credit hours in Ocean Sciences, including:
 - a. Ocean Sciences 2000 (or Biology 3710), 2001, 2100 and at least one of 2500 or 4500 (or Biology 3709 or 4710). Ocean Sciences 1000, successfully completed under <u>Admission</u> <u>Requirements for the Major in Ocean Sciences or the Major in Ocean Sciences</u> (<u>Environmental Systems</u>), will count as 3 of the required 30 credit hours in Ocean Sciences;
 - b. at least one of Ocean Sciences 2200 or 2300; and
 - c. at least 9 credit hours in Ocean Sciences courses at the 3000 and/or 4000 level.
- extra Science courses as necessary to fulfil the minimum requirement for 78 credit hours in Science as stipulated under <u>Electives</u> of the <u>Degree Regulations</u> for the General Degree of Bachelor of Science. The program should include a minimum of 15 credit hours in Science courses at the 3000 and/or 4000 level; and
- 12. elective courses as necessary to make up the total of 120 credit hours.

11.9.3.3 Program Regulations for the Major in Ocean Sciences (Environmental Systems)

Students must successfully complete:

- 9. the 30 credit hours required under <u>Admission Requirements for the Major in Ocean Sciences</u> or the Major in Ocean Sciences (Environmental Systems);
- 10. Statistics 2550 or any of the courses listed in the credit restrictions of Statistics 2550;
- 11. Physics 1021 or 1051;
- 12. Geography 1050, and at least two of Geography 2102, 2195, or 2425;
- 13. Earth Sciences 1002, 2502;
- 14. at least 9 credit hours at the 3000 and/or 4000 level chosen from:
 - a. Geography 3120, 3140, 3250, 3425, 3510, 4050, 4060, 4190, 4250, 4917; and
 b. Earth Sciences 3600, 4605, 4903.
- 15. a minimum of 30 credit hours in Ocean Sciences, including:
 - a. Ocean Sciences 2000 (or Biology 3710), 2001, 2100 and at least one of 2500 or 4500 (or Biology 3709 or 4710). Ocean Sciences 1000, successfully completed under <u>Admission</u>

<u>Requirements for the Major in Ocean Sciences or the Major in Ocean Sciences</u> (<u>Environmental Systems</u>), will count as 3 of the required 30 credit hours in Ocean Sciences;

b. at least 9 credit hours in Ocean Sciences courses at the 3000 and/or 4000 level.

16. elective courses as necessary to make up the total of 120 credit hours.

11.9.4.2 Program Regulations for the Honours in Ocean Sciences

Students must successfully complete:

- 8. the 30 credit hours required under <u>Admission Requirements for the Major in Ocean Sciences</u> <u>or the Major in Ocean Sciences (Environmental Systems)</u>;
- Chemistry 2400 (or equivalent). Chemistry 2440 will be accepted as a substitute for Chemistry 2400. However, a number of advanced Science courses may require Chemistry 2400 and 2401. Students are therefore strongly encouraged to successfully complete the Chemistry 2400/2401 sequence or otherwise carefully plan their options;
- 10. Physics 1021 or 1051;
- 11. Statistics 2550 or any of the courses listed in the credit restrictions of Statistics 2550;
- 12. a minimum of 12 credit hours chosen from:
 - a. Biology 2060, 2122, 2250, 2600, 2900;
- b. Biochemistry 2100, 2201 or the former 2101, 3206 or 3106, 3207 or 3107, 3108;
- 13. a minimum of 45 credit hours in Ocean Sciences, including:
 - a. Ocean Sciences 2000 (or Biology 3710), 2001, 2100, 2200, 2300 and at least one of 2500 or 4500 (or Biology 3709 or 4710). Ocean Sciences 1000, successfully completed under <u>Admission Requirements for the Major in Ocean Sciences or the Major in Ocean Sciences (Environmental Systems)</u>, will count as 3 of the required 45 credit hours in Ocean Sciences;
 - b. at least 18 credit hours in Ocean Sciences courses at the 3000 and/or 4000 level.
 - c. Ocean Sciences 499A/B; and
- 14. elective courses as necessary to make up the total of 120 credit hours including a minimum of 15 credit hours at the 3000 and/or 4000 level in any of Biochemistry, Biology, Chemistry, Earth Sciences, Environmental Science, Geography, Ocean Sciences or Physics (these 15 credit hours can include courses completed as part of the requirements in 5.b. but not those required as part of 6. above).

Secondary Calendar Change to Biology Courses (marked)

13.2 Biology

3709 Field Course in Marine Principles and Techniques begins with a two-week field school immediately prior to the beginning of the Fall Semester. In the Fall Semester there are follow-up lectures, readings and submission of reports. The course is designed to introduce the principal marine environments, organisms and techniques. It is strongly recommended that this course be taken before either BIOL-3710, 3711 or 4810.

Secondary Calendar Change to Biology Courses (clean)

13.2 Biology

3709 Field Course in Marine Principles and Techniques begins with a two-week field school immediately prior to the beginning of the Fall Semester. In the Fall Semester there are follow-up lectures, readings and submission of reports. The course is designed to introduce the principal marine environments, organisms and techniques. It is strongly recommended that this course be taken before either BIOL 3711 or 4810.

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

From	Response Received
Grenfell Campus	
Arts and Social Science	
Science and the Environment	Yes
Fine Arts	
Faculty of Business Administration	
Faculty of Education	
Faculty of Engineering & Applied Science	Yes
Faculty of Humanities & Social Sciences	
Faculty of Science	
Department of Biochemistry	Yes
Department of Biology	
Department of Chemistry	
Department of Computer Science	
Department of Earth Sciences	
Department of Economics	
Department of Geography	
Department of Mathematics and Statistics	
Department of Physics and Physical Oceanography	
Department of Psychology	
Labrador Institute (Artic and Subarctic Studies)	
Cabaal of Liveran Kinatias and Decreation	N/s s
School of Human Kinelics and Recreation	Yes
School of Music	Vac
School of Mursing	res
School of Dearmany	Vaa
School of Social Work	165

LIBRARY REPORT

Not applicable.

RESOURCE IMPLICATIONS

No new resources required.

Appendix 1 – Consultations

Initial request sent 12 October 2022

From: Gagnon, Patrick

Sent: Wednesday, October 12, 2022 3:47 PM

To: Faculty of Humanities and Social Sciences <hss@mun.ca>; Oldford, Erin <eoldford@mun.ca>; Furey, Edith <efurey@mun.ca>; 'engrconsult@mun.ca' <engrconsult@mun.ca>; HKR Dean <hkrdean@mun.ca>; 'deanofmedicine@med.mun.ca' <deanofmedicine@med.mun.ca>; Karen Bulmer <kbulmer@mun.ca>; DeanNurse <DeanNurse@mun.ca>; 'pharminfo@mun.ca' <pharminfo@mun.ca>; Dean of Science <deansci@mun.ca>; adeanugradswk <adeanugradswk@mun.ca>; Library Correspondence <univlib@mun.ca>; 'ipercy@grenfell.mun.ca' <ipercy@grenfell.mun.ca'; 'ssedean@grenfell.mun.ca'; 'thennessey@grenfell.mun.ca' <</p>
chennessey@grenfell.mun.ca'; 'miugconsultations@mi.mun.ca' <miugconsultations@mi.mun.ca>; Ashlee Cunsolo <ashlee.cunsolo@mun.ca>
Cc: Rise, Matthew <mrise@mun.ca>

Subject: Consultation on minor changes to requirements for the Majors/Honours in Oceans Sciences and Joint Major/Honours in Marine Biology

Hi All,

The Department of Ocean Sciences is seeking feedback on proposed minor changes to requirements for the Majors/Honours in Oceans Sciences and Joint Major/Honours in Marine Biology. We wish to add BIOL 3709 (Field Course in Marine Principles and Techniques) to the list of possible choices students have to fulfill the minimum requirement for hands-on training in marine science techniques. Please see attached document.

I would be grateful if you could please provide comments and feedback to me (<u>pgagnon@mun.ca</u>), if possible by October 26th.

All the best

Pat

Dr. Patrick Gagnon Professor and Deputy Head (Undergraduate) Department of Ocean Sciences Ocean Sciences Centre, Memorial University of Newfoundland St. John's, NL, A1C 5S7, Canada

Tel: (709) 864-7663 Fax: (709) 864-3220 Email: <u>pgagnon@mun.ca</u>

FEEDBACK RECEIVED

Pharmacy

From: Davis,Erin <emdavis@mun.ca>
Sent: Wednesday, October 12, 2022 4:23 PM
To: Gagnon, Patrick <pgagnon@mun.ca>
Subject: FW: Consultation on minor changes to requirements for the Majors/Honours in Oceans
Sciences and Joint Major/Honours in Marine Biology

Hi Pat,

Thank you for the opportunity to comment on the proposed changes. As they are not expected to affect pharmacy students or programs we have no concerns.

Erin ---

Erin Davis, PharmD Associate Dean Undergraduate Studies Associate Professor Memorial University School of Pharmacy T 709 864 8815 E <u>emdavis@mun.ca</u>

<u>Music</u>

Dear Pat, Music has no substantive feedback on these proposed changes. This looks like a positive development for your students. Best wishes, Michelle

Michelle Cheramy, DMA (she/her) Acting Associate Dean (academic), School of Music Memorial University of Newfoundland St. John's, NL, Canada <u>mcheramy@mun.ca</u>

<u>HKR</u>

From: HKR Dean <hkrdean@mun.ca>
Sent: Tuesday, October 18, 2022 2:18 PM
To: Gagnon, Patrick <pgagnon@mun.ca>
Subject: Re: Consultation on minor changes to requirements for the Majors/Honours in Oceans Sciences and Joint Major/Honours in Marine Biology

Hello Pat,

Thank you for the opportunity to review. HKR has reviewed and we have no concerns or comments.

Anne-Marie

Anne-Marie Sullivan (she/her), PhD, CTRS Interim Dean, School of Human Kinetics & Recreation Memorial University, St. John's, NL, A1S 5S7 (p) 709-864-8129; (e) <u>hkrdean@mun.ca</u>

Grenfell (SSE)

From: Sveshnikov, Dmitry <dmitry.sveshnikov@grenfell.mun.ca>
Sent: Tuesday, October 18, 2022 10:35 PM
To: Gagnon, Patrick <pgagnon@mun.ca>
Cc: Dean - School of Science and the Environment <ssedean@grenfell.mun.ca>
Subject: RE: Consultation on minor changes to requirements for the Majors/Honours in Oceans Sciences and Joint Major/Honours in Marine Biology

Good afternoon,

The SSE Committee on Academic Programming has reviewed the materials for the following calendar change proposal:

Minor changes to requirements for the Majors/Honours in Oceans Sciences and Joint Major/Honours in Marine Biology

The Committee has no comments or concerns.

Thank you,

Dmitry Sveshnikov (Chair of SSE-CAP)

Dmitry Sveshnikov, Assoc. Professor Environmental Science / Biology School of Science and the Environment Grenfell Campus Memorial University of Newfoundland 20 University Drive, Corner Brook Newfoundland, Canada, A2H 5G4

Office: AS213 Phone: +1(709)639-6528 (leave a message) Email: <u>dmitry.sveshnikov@grenfell.mun.ca</u>

Biochemistry

From: BiocDHundergrad <biocdhundergrad@mun.ca>
Sent: Thursday, October 20, 2022 2:03 PM
To: Gagnon, Patrick <pgagnon@mun.ca>
Subject: Fw: Consultation on minor changes to requirements for the Majors/Honours in Oceans Sciences and Joint Major/Honours in Marine Biology

Hi Patrick,

Biochemistry is supportive of this proposed calendar change. It is great to add as much experiential learning to your program as possible.

Cheers,

Janet

Janet Brunton, PhD Professor and Deputy Head (Undergraduate)

Department of Biochemistry Memorial University of Newfoundland

phone 709 864-8533 fax: 709 864-2422

Engineering

From: Engineering Consult <engrconsult@mun.ca> Sent: Monday, October 24, 2022 1:46 PM To: Gagnon, Patrick <pgagnon@mun.ca> Subject: Re: Consultation on minor changes to requirements for the Majors/Honours in Oceans Sciences and Joint Major/Honours in Marine Biology

Hi,

Thanks for giving us the opportunity to provide feedback on the calendar change proposal. The Faculty of Engineering and Applied Science Committee on Undergraduate Studies does not anticipate any impact of the proposed changes on engineering programs. Sincerely, Salim

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

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- \Box New course(s):
- X Amended or deleted course(s): OCSC 3600
- □ New program(s):
- \Box Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- □ New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council: _____

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

COURSE NUMBER AND TITLE

OCSC 3600 Marine Microbiology

RATIONALE

This is a proposal to modify course requisites to this Ocean Sciences course, which is an elective in the Minor in Oceanography, and Majors in Ocean Sciences and Marine Biology. Currently, students must complete one of three 2000-level Biology or Biochemistry courses prior to OCSC 3600. One of these interchangeable prerequisites, Biology 2250 (Principles of Genetics), is taught in the same semester (Fall) as OCSC 3600, which prevents attendance in the latter by students facing scheduling conflicts at the end of their study programs. After reviewing both courses' syllabi (with a focus on nature and sequence of topics delivery) and consulting with Biology, it was determined that both courses can be taken simultaneously without impacting a student's ability to progress normally in OCSC 3600. Accordingly, we are proposing to change the current designation for Biology 2250 from course prerequisite (PR) only to also course co-requisite (CO). We are also proposing to change the current designation for Biology 2250 from PR only to also CO to avoid potential misperception by students that they need to complete one of the Biochemistry courses in addition to Biology 2250 (taking Biochemistry 2100 or Biochemistry 2200 simultaneously with OCSC 3600 also will not impact a student's ability to progress normally in the latter).

CALENDAR CHANGES: new entry under 13.9 Ocean Sciences

3600 Marine Microbiology provides an overview of microbial activity in the ocean, both in natural and applied settings. The focus is on interactions between microorganisms and other biota, ranging from deep-sea vent invertebrates to commercially cultured fish species. Prospective topics include effluent discharge, water quality, bacterial metabolism and nutrient cycles, bacteria-virus and bacteria-host interactions (including symbioses and pathogenesis), and marine microbial biotechnology.

CO: Biology 2250 or Biochemistry 2100 or Biochemistry 2200 PR: Biology 2250 or Biochemistry 2100 or Biochemistry 2200

CALENDAR ENTRY AFTER CHANGES:

3600 Marine Microbiology provides an overview of microbial activity in the ocean, both in natural and applied settings. The focus is on interactions between microorganisms and other biota, ranging from deep-sea vent invertebrates to commercially cultured fish species. Prospective topics include effluent discharge, water quality, bacterial metabolism and nutrient cycles, bacteria-virus and bacteria-host interactions (including symbioses and pathogenesis), and marine microbial biotechnology.

CO: Biology 2250 or Biochemistry 2100 or Biochemistry 2200

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

From	Response Received
Grenfell Campus	
Arts and Social Science	
Science and the Environment	Yes
Fine Arts	
Faculty of Business Administration	
Faculty of Education	
Faculty of Engineering & Applied Science	
Faculty of Humanities & Social Sciences	
Faculty of Science	
Department of Biochemistry	
Department of Biology	
Department of Chemistry	Yes
Department of Computer Science	
Department of Earth Sciences	
Department of Goography	
Department of Mathematics and Statistics	
Department of Physics and Physical Oceanography	
Department of Psychology	
Labrador Institute (Artic and Subarctic Studies)	
Marine Institute	
School of Human Kinetics and Recreation	
School of Medicine	
School of Music	
School of Nursing	
School of Pharmacy	
School of Social Work	

LIBRARY REPORT

Not applicable.

RESOURCE IMPLICATIONS

No new resources required.

3

Appendix 1 – Consultations

Initial request sent 10 October 2022

From: Gagnon, Patrick
Sent: Thursday, November 10, 2022 3:44 PM
To: deansciassistant <deansciassistant@mun.ca>
Cc: Rise, Matthew <mrise@mun.ca>
Subject: Ocean Sciences documents for consultation

Hi Cherie,

Can you please send the 7 attached documents from the Ocean Sciences Committee on Undergraduate Programs out for consultation? The 4 course syllabi accompany the proposal for regularization. Feedback can be sent to me (pgagnon@mun.ca), if possible by Monday, Nov 21st.

Thank you! Pat

Dr. Patrick Gagnon Professor and Deputy Head (Undergraduate) Department of Ocean Sciences Ocean Sciences Centre, Memorial University of Newfoundland St. John's, NL, A1C 5S7, Canada

Tel: (709) 864-7663 Fax: (709) 864-3220 Email: pgagnon@mun.ca

FEEDBACK RECEIVED

Chemistry

From: Katz, Michael <mkatz@mun.ca>
Sent: Sunday, November 20, 2022 11:00 AM
To: Gagnon, Patrick <pgagnon@mun.ca>
Subject: Fwd: Ocean Sciences documents for consultation

Hi Dr Gagnon,

The chemistry department undergraduate studies committee has looked over the proposal and here are our comments. We like these changes and think we would like to try to add some of them to our program:

- Regularization Document: This is taking 4 special topics courses and making them real courses. 3 of 4 of them shouldn't affect our students, One "Immunobiology of Aquatic organisms" (new 4940) might be something to consider adding as an option for Chem (Bio), since immunology in HUBI is a potential option. Fine for now.
 Verdict: Regularization for OCSC 4910, 4920, 4921, 4940 is fine.
- OCSC PR OCSC 2000 document: This is the OCSC side of the BIOL 3710 that we saw last week. I would like to consider adding this course as an option for Chem (Bio) I sent you a document about that last week. It does require OCSC 1000, but I don't think that is a real issue. Verdict: Fine for now, let's consider this course for Chem. (Bio) at some point.
- OCSC 3600 document: This course is an option for Chem (Bio) and several of our students are taking it this year. They are only changing their PR to CO, so that it is easier for students to take it earlier in their programs. Verdict: No problem here.

The rest of the documents are the syllabi for the new courses. Nothing stands out in there. The hot topics course that they do (OCSC 4910 I think) is something we should consider doing. It would be fun.

Grenfell (SSE):

From: Sveshnikov, Dmitry <dmitry.sveshnikov@grenfell.mun.ca>
Sent: Monday, November 21, 2022 1:14 PM
To: Gagnon, Patrick <pgagnon@mun.ca>
Cc: Dean - School of Science and the Environment <ssedean@grenfell.mun.ca>
Subject: RE: Ocean Sciences documents for consultation

Good afternoon,

The SSE Committee on Academic Programming has reviewed the materials from Ocean Sciences, and sent it out for consultation at the Environmental Science at Grenfell Campus.

Changes to OCSC 3600 course requisites – 10 November 2022

The Committee has no comments, and has received no concerns from the unit.

Thank you, Dmitry Sveshnikov (Chair of SSE-CAP)

Dmitry Sveshnikov, Assoc. Professor Environmental Science / Biology School of Science and the Environment Grenfell Campus Memorial University of Newfoundland 20 University Drive, Corner Brook Newfoundland, Canada, A2H 5G4

Office: AS213 Phone: +1(709)639-6528 (leave a message) Email: dmitry.sveshnikov@grenfell.mun.ca
Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

- \Box New course(s):
- X Amended or deleted course(s): OCSC 2000
- □ New program(s):
- \Box Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- □ New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council:

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

COURSE NUMBER AND TITLE

OCSC 2000 Introductory Biological Oceanography

RATIONALE

This is a proposal to modify course prerequisites to this Ocean Sciences course, which is required for the Minor in Oceanography, and Majors in Ocean Sciences and Marine Biology. This change is motivated by a related proposal from the Department of Biology to modify the structure and content of BIOL 3710 (Biological Oceanography) to eliminate overlap with OCSC 2000 while filling a gap in the undergraduate curriculum of both Biology and Ocean Sciences. If approved, the revised BIOL 3710 will include OCSC 2000 as one of its course prerequisites. Current course prerequisites to OCSC 2000 include OCSC 1000 (Exploration of the World Ocean), which is NOT a required course for Biology students. The first-year biology courses BIOL 1001 and BIOL 1002 (Principles of Biology) are an equivalent / satisfactory suite of prerequisites for OCSC 2000; this addition will ensure that students in both programs can register for this course at an appropriate point in their program. Since Biology's proposal aims to eliminate overlap with OCSC 2000, we are also proposing to remove the credit restriction on BIOL 3710.

CALENDAR CHANGES: new entry under 13.9 Ocean Sciences

2000 Introductory Biological Oceanography provides a general understanding of the biological processes that occur in coastal and oceanic environments. It introduces students to the major groups of bacteria, phytoplankton, invertebrates and fish, emphasizing the biotic and abiotic factors controlling primary production and marine biomass. It shows how the physical, chemical, and geological environments interact with biology to define processes and patterns affecting nutrients and life in marine ecosystems.

CR: Biology 3710

PR: OCSC 1000 and another 1000-level course in one of Biology, Chemistry, Earth Sciences or Physics (or Biology 1001 and 1002)

CALENDAR ENTRY AFTER CHANGES:

2000 Introductory Biological Oceanography provides a general understanding of the biological processes that occur in coastal and oceanic environments. It introduces students to the major groups of bacteria, phytoplankton, invertebrates and fish, emphasizing the biotic and abiotic factors controlling primary production and marine biomass. It shows how the physical, chemical, and geological environments interact with biology to define processes and patterns affecting nutrients and life in marine ecosystems.

PR: OCSC 1000 and another 1000-level course in one of Biology, Chemistry, Earth Sciences or Physics (or Biology 1001 and 1002)

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

From

Response Received

Grenfell Campus Arts and Social Science Science and the Environment Fine Arts Faculty of Business Administration Faculty of Education Faculty of Engineering & Applied Science Faculty of Humanities & Social Sciences Faculty of Science Department of Biochemistry Department of Biology Department of Chemistry **Department of Computer Science** Department of Earth Sciences **Department of Economics** Department of Geography Department of Mathematics and Statistics Department of Physics and Physical Oceanography Department of Psychology Labrador Institute (Artic and Subarctic Studies) Marine Institute School of Human Kinetics and Recreation School of Medicine School of Music School of Nursing School of Pharmacy School of Social Work

LIBRARY REPORT

Not applicable.

RESOURCE IMPLICATIONS

No new resources required.

Yes

Appendix 1 – Consultations

Initial request sent 10 October 2022

From: Gagnon, Patrick
Sent: Thursday, November 10, 2022 3:44 PM
To: deansciassistant <deansciassistant@mun.ca>
Cc: Rise, Matthew <mrise@mun.ca>
Subject: Ocean Sciences documents for consultation

Hi Cherie,

Can you please send the 7 attached documents from the Ocean Sciences Committee on Undergraduate Programs out for consultation? The 4 course syllabi accompany the proposal for regularization. Feedback can be sent to me (pgagnon@mun.ca), if possible by Monday, Nov 21st.

Thank you! Pat

Dr. Patrick Gagnon Professor and Deputy Head (Undergraduate) Department of Ocean Sciences Ocean Sciences Centre, Memorial University of Newfoundland St. John's, NL, A1C 5S7, Canada

Tel: (709) 864-7663 Fax: (709) 864-3220 Email: pgagnon@mun.ca

FEEDBACK RECEIVED

Chemistry

From: Katz, Michael <mkatz@mun.ca>
Sent: Sunday, November 20, 2022 11:00 AM
To: Gagnon, Patrick <pgagnon@mun.ca>
Subject: Fwd: Ocean Sciences documents for consultation

Hi Dr Gagnon,

The chemistry department undergraduate studies committee has looked over the proposal and here are our comments. We like these changes and think we would like to try to add some of them to our program:

- Regularization Document: This is taking 4 special topics courses and making them real courses. 3 of 4 of them shouldn't affect our students, One "Immunobiology of Aquatic organisms" (new 4940) might be something to consider adding as an option for Chem (Bio), since immunology in HUBI is a potential option. Fine for now.
 Verdict: Regularization for OCSC 4910, 4920, 4921, 4940 is fine.
- OCSC PR OCSC 2000 document: This is the OCSC side of the BIOL 3710 that we saw last week. I would like to consider adding this course as an option for Chem (Bio) I sent you a document about that last week. It does require OCSC 1000, but I don't think that is a real issue. Verdict: Fine for now, let's consider this course for Chem. (Bio) at some point.
- 3. OCSC 3600 document: This course is an option for Chem (Bio) and several of our students are taking it this year. They are only changing their PR to CO, so that it is easier for students to take it earlier in their programs. **Verdict: No problem here.**

The rest of the documents are the syllabi for the new courses. Nothing stands out in there. The hot topics course that they do (OCSC 4910 I think) is something we should consider doing. It would be fun.

Grenfell (SSE):

From: Sveshnikov, Dmitry <dmitry.sveshnikov@grenfell.mun.ca>
Sent: Monday, November 21, 2022 1:14 PM
To: Gagnon, Patrick <pgagnon@mun.ca>
Cc: Dean - School of Science and the Environment <ssedean@grenfell.mun.ca>
Subject: RE: Ocean Sciences documents for consultation

Good afternoon,

The SSE Committee on Academic Programming has reviewed the materials from Ocean Sciences, and sent it out for consultation at the Environmental Science at Grenfell Campus.

The Committee has no comments, and has received no concerns from the unit.

Thank you, Dmitry Sveshnikov (Chair of SSE-CAP)

Dmitry Sveshnikov, Assoc. Professor Environmental Science / Biology School of Science and the Environment Grenfell Campus Memorial University of Newfoundland 20 University Drive, Corner Brook Newfoundland, Canada, A2H 5G4

Office: AS213 Phone: +1(709)639-6528 (leave a message) Email: dmitry.sveshnikov@grenfell.mun.ca

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

 \Box New course(s):

X Amended or deleted course(s): OCSC 4910; OCSC 4920; OCSC 4921; OCSC 4940.

- □ New program(s):
- \Box Amended or deleted program(s):
- □ New, amended or deleted Glossary of Terms Used in the Calendar entries
- □ New, amended or deleted Admission/Readmission to the University (Undergraduate) regulations
- □ New, amended or deleted General Academic Regulations (Undergraduate)
- □ New, amended or deleted Faculty, School or Departmental regulations
- □ Other:

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council:

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

COURSE NUMBER AND TITLE

OCSC 4910 Hot Topics in Oceanography (Special Topics course)

REVISED COURSE NUMBER AND TITLE

OCSC 4700 Hot Topics in Oceanography

ABBREVIATED COURSE TITLE

Hot Topics in Oceanography

RATIONALE

This is a proposal for regularization of this Ocean Sciences course, which has been taught for 3 semesters (W2020, W2021, W2022) as a Special Topics course. This course is elective for the Majors in Ocean Sciences and Marine Biology. Because it is an upper-level course and the programs are relatively new, we hope to increase visibility and enrollment by making it a regular offering.

CALENDAR CHANGES: new entry under 13.9 Ocean Sciences

4700 Hot Topics in Oceanography focuses on areas of study of heightened current interest to both oceanographers and the public. Examples include changes in ocean conditions under global warming and degradation of the marine environment by polluting plastics. This course provides students with current information on a Hot Topic and prepares them for public speaking. Students are encouraged to think about relevant issues from both a scientific and societal perspective.

<u>LH: 3</u>

PR: OCSC 1000 and a minimum of 3 credit hours at the 3000 level in any Science course

CALENDAR ENTRY AFTER CHANGES:

4700 Hot Topics in Oceanography focuses on areas of study of heightened current interest to both oceanographers and the public. Examples include changes in ocean conditions under global warming and degradation of the marine environment by polluting plastics. This course provides students with current information on a Hot Topic and prepares them for public speaking. Students are encouraged to think about relevant issues from both a scientific and societal perspective.

LH: 3

PR: OCSC 1000 and a minimum of 3 credit hours at the 3000 level in any Science course

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

COURSE NUMBER AND TITLE

OCSC 4920 Special Topics in Crustacean Biology

REVISED COURSE NUMBER AND TITLE

OCSC 4600 Crustacean Biology

ABBREVIATED COURSE TITLE

Crustacean Biology

RATIONALE

This is a proposal for regularization of this Ocean Sciences course, which has been taught for 3 semesters (W2020, W2021, W2022) as a Special Topics course. This course is elective for the Majors in Ocean Sciences and Marine Biology. Because it is an upper-level course and the programs are relatively new, we hope to increase visibility and enrollment by making it a regular offering. This course is also relevant to Biology programs, so we are proposing to cross-list it with Biology to make it accessible and further maximize enrollment.

CALENDAR CHANGES: new entry under 13.9 Ocean Sciences

4600 Crustacean Biology (same as Biology 4600) is designed to give students exposure to all aspects of crustacean biology including, but not limited to classification, anatomy and morphology, physiology, behaviour, fisheries and aquaculture. The lectures are combined with interactive activities where students can look at representative specimens, learn through dissection and simple behavioural experiments.

<u>CR: Biology 4600</u> <u>LH: 3</u> <u>PR: OCSC 2000; Biology 2122 and 2600</u>

CALENDAR ENTRY AFTER CHANGES

4600 Crustacean Biology (same as Biology 4600) is designed to give students exposure to all aspects of crustacean biology including, but not limited to classification, anatomy and morphology, physiology, behaviour, fisheries and aquaculture. The lectures are combined with interactive activities where students can look at representative specimens, learn through dissection and simple behavioural experiments.

CR: Biology 4600 LH: 3 PR: OCSC 2000; Biology 2122 and 2600

SECONDARY CALENDAR CHANGES: new entry under 13.2 Biology

4600 Crustacean Biology (same as Ocean Sciences 4600) is designed to give students exposure to all aspects of crustacean biology including, but not limited to classification, anatomy and morphology, physiology, behaviour, fisheries and aquaculture. The lectures are combined with interactive activities where students can look at representative specimens, learn through dissection and simple behavioural experiments.

<u>CR: Ocean Sciences 4600</u> <u>LH: 3</u> PR: Ocean Sciences 2000; BIOL 2122 and 2600

SECONDARY CALENDAR ENTRY AFTER CHANGES

4600 Crustacean Biology (same as Ocean Sciences 4600) is designed to give students exposure to all aspects of crustacean biology including, but not limited to classification, anatomy and morphology, physiology, behaviour, fisheries and aquaculture. The lectures are combined with interactive activities where students can look at representative specimens, learn through dissection and simple behavioural experiments.

CR: Ocean Sciences 4600

LH: 3

PR: Ocean Sciences 2000; BIOL 2122 and 2600

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

COURSE NUMBER AND TITLE

OCSC 4921 Special Topics in Reproductive Strategies of Marine Animals

REVISED COURSE NUMBER AND TITLE

OCSC 4602 Reproductive Strategies of Marine Animals

ABBREVIATED COURSE TITLE

Reproduct Strat Mar Animals

RATIONALE

This is a proposal for regularization of this Ocean Sciences course, which has been taught for 3 semesters (W2020, W2021, W2022) as a Special Topics course. This course is elective for the Majors in Ocean Sciences and Marine Biology. Because it is an upper-level course and the programs are relatively new, we hope to increase visibility and enrollment by making it a regular offering.

CALENDAR CHANGES: new entry under 13.9 Ocean Sciences

4602 Reproductive Strategies of Marine Animals explores the principles and tactics of reproduction in an evolutionary ecology context, with an emphasis on adaptations to the marine environment. It focuses on the behavioural, ecological and life-history means by which marine animals maximize their lifetime reproductive success. The course covers such topics as sex determination, hermaphroditism, sex ratio, reproductive allocation, mating systems, sexual selection, sexual dimorphism, and parental investment. Various reproductive strategies are exemplified in the major groups of marine animals.

LH: 3 PR: OCSC 1000, Biology 2600 and 2900

CALENDAR ENTRY AFTER CHANGES

4602 Reproductive Strategies of Marine Animals explores the principles and tactics of reproduction in an evolutionary ecology context, with an emphasis on adaptations to the marine environment. It focuses on the behavioural, ecological and life-history means by which marine animals maximize their lifetime reproductive success. The course covers such topics as sex determination, hermaphroditism, sex ratio, reproductive allocation, mating systems, sexual selection, sexual dimorphism, and parental investment. Various reproductive strategies are exemplified in the major groups of marine animals.

LH: 3 PR: OCSC 1000, Biology 2600 and 2900

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

COURSE NUMBER AND TITLE

OCSC 4940 Special Topics in Immunobiology of Aquatic Organisms

REVISED COURSE NUMBER AND TITLE

OCSC 4603 Immunobiology of Aquatic Organisms

ABBREVIATED COURSE TITLE

Immunobiology Aqua Organisms

RATIONALE

This is a proposal for regularization of this Ocean Sciences course, which has been taught for 3 semesters (W2020, W2021, W2022) as a Special Topics course. This course is an elective for the Majors in Ocean Sciences and Marine Biology. Because it is an upper-level course and the programs are relatively new, we hope to increase visibility and enrollment by making it a regular offering. Currently, Biology 2060 Principles of Cell Biology is one of several course prerequisites. Careful re-examination of this requirement, including chronology of topics taught in both courses, indicated that Biology 2060 can be taken simultaneously (as a co-requisite) with OCSC 4603. Accordingly, we wish to change the current designation for Biology 2060 from "PR" to "CO".

CALENDAR CHANGES: new entry under 13.9 Ocean Sciences

4603 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. Lab visits and mini-labs are part of this course.

<u>LH: 3</u>

PR: Biology 2250 or Biochemistry 2100 or Biochemistry 2200 CO: Biology 2060

CALENDAR ENTRY AFTER CHANGES

4603 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. Lab visits and mini-labs are part of this course.

LH: 3

PR: Biology 2250 or Biochemistry 2100 or Biochemistry 2200 CO: Biology 2060

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Page

From	Response Received
Grenfell Campus	
Arts and Social Science	
Science and the Environment	Yes
Fine Arts	
Faculty of Business Administration	
Faculty of Education	
Faculty of Engineering & Applied Science	
Faculty of Humanities & Social Sciences	
Faculty of Science	
Department of Biochemistry	
Department of Biology	
Department of Chemistry	Yes
Department of Computer Science	
Department of Earth Sciences	
Department of Economics	
Department of Geography	
Department of Mathematics and Statistics	
Department of Physics and Physical Oceanography	
Labradar Institute (Artic and Subarctic Studies)	
Marine Institute	
School of Human Kinotics and Pocreation	
School of Medicine	
School of Music	
School of Nursing	
School of Pharmacy	
School of Social Work	

LIBRARY REPORT

Not applicable.

RESOURCE IMPLICATIONS

No new resources required.

Regularization of OCSC Courses – 10 Nov 2022

Appendix 1 – Consultations

Initial request sent 10 October 2022

From: Gagnon, Patrick
Sent: Thursday, November 10, 2022 3:44 PM
To: deansciassistant <deansciassistant@mun.ca>
Cc: Rise, Matthew <mrise@mun.ca>
Subject: Ocean Sciences documents for consultation

Hi Cherie,

Can you please send the 7 attached documents from the Ocean Sciences Committee on Undergraduate Programs out for consultation? The 4 course syllabi accompany the proposal for regularization. Feedback can be sent to me (pgagnon@mun.ca), if possible by Monday, Nov 21st.

Thank you! Pat

Dr. Patrick Gagnon Professor and Deputy Head (Undergraduate) Department of Ocean Sciences Ocean Sciences Centre, Memorial University of Newfoundland St. John's, NL, A1C 5S7, Canada

Tel: (709) 864-7663 Fax: (709) 864-3220 Email: pgagnon@mun.ca

FEEDBACK RECEIVED

Chemistry

From: Katz, Michael <mkatz@mun.ca>
Sent: Sunday, November 20, 2022 11:00 AM
To: Gagnon, Patrick <pgagnon@mun.ca>
Subject: Fwd: Ocean Sciences documents for consultation

Hi Dr Gagnon,

The chemistry department undergraduate studies committee has looked over the proposal and here are our comments. We like these changes and think we would like to try to add some of them to our program:

- Regularization Document: This is taking 4 special topics courses and making them real courses. 3 of 4 of them shouldn't affect our students, One "Immunobiology of Aquatic organisms" (new 4940) might be something to consider adding as an option for Chem (Bio), since immunology in HUBI is a potential option. Fine for now.
 Verdict: Regularization for OCSC 4910, 4920, 4921, 4940 is fine.
- OCSC PR OCSC 2000 document: This is the OCSC side of the BIOL 3710 that we saw last week. I would like to consider adding this course as an option for Chem (Bio) I sent you a document about that last week. It does require OCSC 1000, but I don't think that is a real issue. Verdict: Fine for now, let's consider this course for Chem. (Bio) at some point.
- 3. OCSC 3600 document: This course is an option for Chem (Bio) and several of our students are taking it this year. They are only changing their PR to CO, so that it is easier for students to take it earlier in their programs. Verdict: No problem here.

The rest of the documents are the syllabi for the new courses. Nothing stands out in there. The hot topics course that they do (OCSC 4910 I think) is something we should consider doing. It would be fun.

Grenfell (SSE):

From: Sveshnikov, Dmitry <dmitry.sveshnikov@grenfell.mun.ca>
Sent: Monday, November 21, 2022 1:14 PM
To: Gagnon, Patrick <pgagnon@mun.ca>
Cc: Dean - School of Science and the Environment <ssedean@grenfell.mun.ca>
Subject: RE: Ocean Sciences documents for consultation

Good afternoon,

The SSE Committee on Academic Programming has reviewed the materials from Ocean Sciences, and sent it out for consultation at the Environmental Science at Grenfell Campus.

Regularization of OCSC Courses – 10 Nov 2022

The Committee has no comments, and has received no concerns from the unit.

Thank you, Dmitry Sveshnikov (Chair of SSE-CAP)

Dmitry Sveshnikov, Assoc. Professor Environmental Science / Biology School of Science and the Environment Grenfell Campus Memorial University of Newfoundland 20 University Drive, Corner Brook Newfoundland, Canada, A2H 5G4

Office: AS213 Phone: +1(709)639-6528 (leave a message) Email: dmitry.sveshnikov@grenfell.mun.ca

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Cover Page

LIST OF CHANGES

Indicate the Calendar change(s) being proposed by checking and completing as appropriate:

X New program(s): A new undergraduate program, Human Biosciences, is proposed by the Department of Biochemistry. It will eventually replace two majors, Biochemistry and Biochemistry (Nutrition)

X New course(s): Seven courses have been developed to support the new undergraduate program, which are a reformulation of existing courses.

ADMINISTRATIVE AUTHORIZATION

By signing below, you are confirming that the attached Calendar changes have obtained all necessary Faculty/School approvals, and that the costs, if any, associated with these changes can be met from within the existing budget allocation or authorized new funding for the appropriate academic unit.

Signature of Dean/Vice-President:

Date:

Date of approval by Faculty/Academic Council: _____

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Programs

PROGRAM TITLE

BSc in Biochemistry BSc in Biochemistry (Nutrition)

REVISED PROGRAM TITLE

BSc in Human Biosciences

RATIONALE

The Department of Biochemistry underwent the Academic Unit Planning review process in early 2020, and an important recommendation by the review panel was that, "The Department should conduct a comprehensive review of the undergraduate curricula with a focus on the skills and competencies and prerequisites". We embraced this advice, and engaged the Centre for Innovation in Teaching and Learning (CITL). During multiple retreats over an 18-month period, personnel from CITL led Biochemistry faculty and staff through the process of identifying the "Foundational Pillars" that comprise the specific core concepts that should be included in our degree programs. We also established "Program Level Learning Outcomes" that outlined practical and transferrable skills that must be achieved by graduates of our program. Both processes identified redundancies and considerable overlap in our current course content, and surprisingly little difference in program content between our current majors programs, albeit with different emphases. Through the CITL-led process, we were able to identify that a single interdisciplinary program in "Human Biosciences" would provide a more efficient, modernized route that would address the growing pedagogical demand for interdisciplinary programs that address **BOTH** food and drug aspects of human health and disease, while ensuring the core content and competencies are included and importantly, maintained over time. Crucially, this also matched with the changing face of the departmental expertise that has arisen through significant faculty renewal (> 50% of faculty have been replaced in the last 5 years), such that 15 of 16 current faculty members have funded research programs with a significant human health focus. The proposed program is fully consistent with the recently approved Faculty of Science strategic plan for Transformative Education, which identifies engagement with CITL to provide more student-centric programming, and the development of interdisciplinary programs including "pre-health care" options.

The new proposed program in Human Biosciences has been structured to consist of introductory courses offered in a traditional disciplinary manner to provide required foundational biochemical, nutrition, and molecular concepts, followed by a common mandatory core of interdisciplinary courses that build on this foundational knowledge with a focus on the application of these concepts to human health and disease.

Importantly, these core courses have been designed to be truly interdisciplinary spanning Biochemistry, Nutrition, Pharmacology and Toxicology, rather than a simple amalgam of multiple discipline specific courses. Each course will be co-taught by faculty from different disciplinary backgrounds, to ensure that content is presented through an interdisciplinary lens. The recent introduction of our new first year course titled "Food, Drugs and Your Body" has allowed this interdisciplinary approach to be trialled and has been an overwhelming success, exemplifying a definite student interest in the integration and delivery of food and drug concepts related to human health, including within individual lectures. Furthermore, this course provided clear pedagogical validation of the feasibility and student interest in the blended approach between traditionally separate disciplines related to human health. Following completion of the core program, students will then have the freedom to design their own sub-specialization in upper years through the selection of elective courses in their 3rd and 4th year that can lead to one of 4 pre-defined sub-foci (Nutrition, Biochemistry, Gene Regulation, Health & Disease) or a general Human Biosciences degree with broader coverage. Where prerequisite requirements and resources allow, we intend to also incorporate select course offerings from other departments to further broaden the coverage within these specialty options for students. This new program structure will allow for more effective use of resources and will leverage the expertise within and outside the department now and in the future.

In simple terms, our curriculum review identified very few differences in program learning outcomes between our two programs (Biochemistry and Nutrition), likely because of the emerging appreciation of the interplay of the role of diet in human health with the more traditional focus on pharmaceutical approaches. Importantly, we believe that the new interdisciplinary approach will also facilitate the incorporation of world indigenous peoples' health practices throughout our curriculum.

There is an established, clear demand for undergraduate programming focussed on the molecular basis of human health and disease; the existing Biochemistry and Nutrition programs graduate approximately 75-80 undergraduate students per year. This program will serve that same student population, but provide for a broader interdisciplinary experience, leading to more well-rounded graduates, while allowing sub-specialization in individual interests. Our intent is to gradually phase in the new program while simultaneously phasing out the existing programs, to allow students in one of the existing programs to complete their studies. The intention is for the new program to initially be offered at the 2000-level in the 2023-24 academic year, with new 3000-level content beginning 2024-25. Existing content at equivalent levels will be simultaneously phased out, such that in the 2025-26 academic year only Human Biosciences programming will be offered by the department giving a resource-neutral end product. Beginning in the 2023-24 academic year students in their second year (or below) will only be accepted into the new Human Biosciences program. Existing joint honours options will be maintained with "Biochemistry" and "Biochemistry(Nutrition)" options replaced with Human Biosciences according to the schedule articulated above.

CALENDAR CHANGES

The Human Biosciences program will be introduced into the Calendar as a completely new entry. The current programs (Biochemistry, Biochemistry Honours, Biochemistry (Nutrition), Biochemistry (Nutrition) Honours, and the Joint Honours programs) will remain in the Calendar and will be phased out as students enroll in the new program.

Note: for consultation purposes only, "clean" Calendar entries are provided, as well as a table of contents with links to sections

Table of Contents Links for Program Information

- 1. Notation for cessation of Biochemistry joint honours
- 2. Notation for cessation of enrollment in Biochemistry majors
- 3. Program regulations for Human Biosciences admission to major and honours
- 4. Program requirements for Human Biosciences major
- 5. Program requirements for Human Biosciences honours
- 6. Concentrations and requirements for Human Biosciences
- 7. Minor in Human Biosciences
- 8. Joint honours requirements Cell Biology and Human Biosci
- 9. Joint honours requirements Chemistry and Human Biosci
- 10. Joint honours requirements Human Biosci and Physics
- 11. Joint honours requirements Human Biosci and Psychology (Behav Neuro)

To inform students that the current joint honours programs are being phased out, the following notations will be added to the Calendar:

10.2 Joint Honours

10.2.3 Biochemistry and Cell Biology Joint Honours

Note: The last year of admission into the Biochemistry and Cell Biology joint honours program will be in the 2023-2024 academic year. In 2024-2025 and beyond, students who are entering the third year of study may apply for the joint honours program in Human Biosciences and Cell Biology

10.2.4 Biochemistry and Chemistry Joint Honours

Note: The last year of admission into the Biochemistry and Chemistry joint honours program will be in 2023-2024 academic year. In 2024-2025 and beyond, students who are entering the third year of study may apply for the joint honours program in Human Biosciences and Chemistry.

10.2.5 Biochemistry and Physics Joint Honours

Note: The last year of admission into the Biochemistry and Physics joint honours program will be in 2023-2024 academic year. In 2024-2025 and beyond, students who are entering the third year of study may apply for the joint honours program in Human Biosciences and Physics.

10.2.6 Biochemistry and Psychology (Behavioural Neuroscience) Joint Honours

Note: The last year of admission into the Biochemistry and Psychology (Behavioural Neuroscience) joint honours program will be in 2023-2024 academic year. In 2024-2025 and beyond, students who are entering the third year of study may apply for the joint honours program in Human Biosciences and Psychology (Behavioural Neuroscience).

10.2.7 Biochemistry (Nutrition) and Psychology (Behavioural Neuroscience) Joint Honours

Note: The last year of admission into the Biochemistry (Nutrition) and Psychology (Behavioural Neuroscience) joint honours program will be in 2023-2024 academic year. In 2024-2025 and beyond, students who are entering the third year of study may apply for the joint honours program in Human Biosciences and Psychology (Behavioural Neuroscience).

With the launch of the Human Biosciences program, admission to any of the programs in Biochemistry will cease in the 2023-24 year. To inform students, the following notation will be added to the Calendar.

11 Program Regulations

11.1 Biochemistry

Note: The programs formerly offered in Biochemistry (listed below) are no longer offered. Students wishing to choose a major in subject matter related to the Biochemistry or Biochemistry (Nutrition) programs should declare Human Biosciences as a major.

www.mun.ca/biochem

The following undergraduate programs are available were formerly offered in the Department:

- 1. Biochemistry and Cell Biology Joint Honours
- 2. Biochemistry and Chemistry Joint Honours
- 3. Biochemistry and Physics Joint Honours
- 4. Biochemistry and Psychology (Behavioural Neuroscience) Joint Honours
- 5. Biochemistry (Nutrition) and Psychology (Behavioural Neuroscience) Joint Honours
- 6. Major or Honours in Biochemistry
- 7. Major or Honours in Nutrition
- 8. Minor in Biochemistry

The Program Regulations for the Human Biosciences major and honours programs are presented below. These will be completely new entries in the Calendar.

11 Program Regulations

11.X Human Biosciences

www.mun.ca/humanbiosciences

How do food, drugs and the environment impact your health? That is the central question of the Human Biosciences program. Introductory courses provide the necessary background in an interdisciplinary manner with each course blending concepts from biochemistry, nutrition, pharmacology, and toxicology. Students may tailor their program to their own interests through diverse electives leading to one of our pre-defined sub-specialties (Human Biosciences [Biochemistry], Human Biosciences [Nutrition], Human Biosciences [Health and Disease], Human Biosciences [Gene Regulation]), or a student-defined general Human Biosciences degree. Honours degree options involve completion of a research project that may focus on either laboratory-based research, a literature-based systematic/scoping review, education/outreach, or entrepreneurship/business projects, depending on student interests and career goals.

The following undergraduate programs are available are are administered by the Department of Biochemistry:

- 1. Major or Honours in Human Biosciences
- 2. Cell Biology and Human Biosciences Joint Honours
- 3. Chemistry and Human Biosciences Joint Honours
- 4. Human Biosciences and Physics Joint Honours
- 5. Human Biosciences and Psychology (Behavioural Neuroscience) Joint Honours
- 6. Minor in Human Biosciences

Students who wish to enroll in any of these programs should plan their program well in advance so that they will have taken the appropriate prerequisites. Students are advised to consult with the Department Academic Advisor at the earliest opportunity.

For the general and honours degrees in the programs above, students should refer to the Faculty of Science **Degree Regulations** for the **General** and **Honours** degrees of Bachelor of Science. For a Minor in Human Biosciences, students should refer to **Degree Regulations**, **Minor Programs in the Faculty of Science**. All students are **strongly** advised to review the Faculty of Science **Graduation Requirements (4.8)** and in particular, the requirements for **Academic Standing (4.8.1)**.

Human Biosciences course descriptions are found at the end of the Faculty of Science section under Course Descriptions, Human Biosciences.

Students are encouraged to choose a minor.

11.X.1 Admission to Programs in Human Biosciences

Students seeking admission to any Human Biosciences program should apply no later than May 31 to ensure the application is processed before registration opens for the next academic year. Failure to apply before May 31 may result in the inability to register for required courses. Eligibility for scholarships and awards in Human Biosciences may also be affected.

11.X.1.1 Admission to the Major in Human Biosciences

Entry to the Human Biosciences Major program is based on academic standing.

1. To be considered for admission to the program students must have at least **24 credit hours** in courses and have successfully completed the following courses (or their equivalents) with a

minimum overall average of 60%. In addition, students must be eligible for entry to Chemistry 2400.

- a. Six credit hours in **Critical Reading and Writing (CRW)** courses, including at least 3 credit hours in English courses.
- b. Chemistry 1050 and 1051 (or 1200 and 1001).
- c. Mathematics 1000.
- d. Biology 1001.
- e. Biology 1002 or Human Biosciences 1001 (or Biochemistry 1600).

Note: Students who have appropriate high school equivalent courses may be admitted directly into the Human Biosciences major.

11.X.1.2 Admission to the Honours Degree in Human Biosciences

Students normally should apply for an Honours program during their third year of studies. To be eligible for admission, students must be in Honours standing as per **Academic Standing** in the **Degree Regulations** for the Honours Degree of Bachelor of Science.

11.X.2 Regulations for Programs in Human Biosciences

11.X.2.1 Major in Human Biosciences

- 1. Required courses to complete the major:
 - a. Six credit hours in **Critical Reading and Writing (CRW)** courses, including at least 3 credit hours in English courses.
 - Biology 1001; Biology 1002 or Human Biosciences 1001 (or Biochemistry 1600); Mathematics 1000 (or equivalent), Statistics 2550 (or equivalent); Chemistry 1050, 1051 (or Chemistry 1200 and 1001).
 - c. Human Biosciences 2001 (or Biochemistry 2101 or 2201), 2002 (or Biochemistry 2600), 2003 (or Biochemistry 3206 or 3106), 2004 (or Biochemistry 2100 or 2200), 2901 (or Biochemistry 2901), 3001, 3002, 3003, 3004, 3005, 3906 (or Biochemistry 3906), 3907 (or Biochemistry 3907).
 - d. Human Biosciences 4800.
 - e. At least six further credit hours from Human Biosciences courses at the 4000-level.
 - f. Medicine 310A/B.
 - g. Chemistry 2400.
 - h. A sufficient number of elective courses to bring the total Science courses up to at least 78 credit hours and the degree total up to 120 credit hours.

11.X.2.2 Honours Degree in Human Biosciences

- 1. Required courses:
 - a. Six credit hours in Critical Reading and Writing (CRW) courses, including at least 3 credit hours in English courses.
 - Biology 1001; Biology 1002 or Human Biosciences 1001 (or Biochemistry 1600); Mathematics 1000 (or equivalent), Statistics 2550 (or equivalent); Chemistry 1050, 1051 (or Chemistry 1200 and 1001).
 - c. Human Biosciences 2001 (or Biochemistry 2101 or 2201), 2002 (or Biochemistry 2600), 2003 (or Biochemistry 3206 or 3106), 2004 (or Biochemistry 2100 or 2200), 2901 (or Biochemistry 2901), 3001, 3002, 3003, 3004, 3005, 3906 (or Biochemistry 3906), 3907 (or Biochemistry 3907), 499A/B.
 - d. Human Biosciences 4800.

- e. At least 15 credit hours from Human Biosciences courses at the 3000 or 4000-level, at least 9 credit hours of which are from the 4000-level.
- f. Medicine 310A/B.
- g. Chemistry 2400.
- h. A sufficient number of elective courses to bring the total for the degree up to 120 credit hours.

11.X.X Human Biosciences Concentrations

While meeting the requirements for a program in Human Biosciences, students may choose to select courses in one of the following formal concentrations, which, if completed, will be noted on the student's transcript. Particular attention should be paid to necessary prerequisites when scheduling courses. Students should consult with the Academic Advisor regarding the availability of courses applicable to their chosen concentration. Students completing a Minor in Human Biosciences will not be able to complete the requirements to achieve a concentration.

11.x.x.1 Biochemistry

Students selecting the Biochemistry concentration are required to complete 15 credit hours from the following courses:

Human Biosciences 3101, 3105, 4002, 4101, 4106, 4200, 4201, 4210, 4232, Chemistry 2100, Chemistry 2401

11.x.x.2 Health and Disease

Students selecting the Health and Disease concentration are required to complete 15 credit hours from the following courses:

Human Biosciences 3101, 3600, 4230, 4231, 4232, 4301, 4240, Biology 3052, Biology 3050, Chemistry 4702

11.x.x.3 Gene Regulation

Students selecting the Molecular Biology concentration are required to complete 15 credit hours from the following courses:

Human Biosciences 3207, 4101, 4104, 4231, 4240, Biology 2250, 3951, 4241, 4606

11.x.x.4 Nutrition

Students selecting the Nutrition concentration are required to complete 15 credit hours from the following courses:

Human Biosciences 3402, 3600, 4230, 4240, 4242, 4300, 4301, 4501, 4106, Biology 3052

11.X.X. Minor in Human Biosciences

Students who wish to take a minor in Human Biosciences will successfully complete:

- a. Human Biosciences 2001, 2002, 2003, 2004.
 - Twelve credit hours in Human Biosciences courses at 3000 or 4000-level.
 Note: Course prerequisites stipulated in the course descriptions shall apply to a minor in Human Biosciences.

The proposed Program Regulations for the Joint Honours with Human Biosciences are presented below. These will be completely new entries in the Calendar.

10.2 Joint Honours

10.2.3 Cell Biology and Human Biosciences Joint Honours

The following courses are required:

- 1. Six credit hours in <u>Critical Reading and Writing (CRW)</u> courses, including at least 3 credit hours in English courses.
- 2. Biology 1001, 1002, Chemistry 1050, 1051 (or 1200 and 1001), Mathematics 1000, Statistics 2550;
- Human Biosciences 2001 (or the former Biochemistry 2101 or 2201), 2002 (or the former Biochemistry 2600), 2003 (or Biochemistry 3206), 2004 (or the former Biochemistry 2100 or 2200), 2901, Chemistry 2400;
- 4. Human Biosciences 3004 and Medicine 310A/B;
- 5. Human Biosciences 4800 (Capstone);
- 6. An additional 15 credit hours to be selected from Human Biosciences 3001, 3002, 3003, 3101, 3906 or 3907, 4002, 4101, 4102, 4104, 4200, 4201, 4230, 4231, 4232;
- 7. Biology 2060, 2250, 2600, 2900, 3530, 4241, plus one of Biology 3401, 3402, 4245 or 4404;
- 12 credit hours from the following: Biology 3050, 3052 (or Biochemistry 3052), 3401, 3402, 3500, the former 3620, 3950, 3951, 4010, the former 4040, 4050, 4200 (or Human Biosciences 3101), 4245, 4250, 4251, the former 4255, 4404, 4550, 4605, 4607;
- 9. Human Biosciences 499A/B or Biology 499A/B; and
- 10. Electives to make up 120 credit hours.

Seventy-five credit hours in Biology, Human Biosciences, Chemistry and Medicine courses beyond the firstyear level from those listed in the program shall contribute to those in which a grade of "B" or an average of 75 or higher is required.

10.2.4 Chemistry and Human Biosciences Joint Honours

The following courses are required:

- 1. Six credit hours in <u>Critical Reading and Writing (CRW)</u> courses, including at least 3 credit hours in English courses;
- Chemistry 1050 and 1051 (or Chemistry 1200 and 1001), Mathematics 1000 and 1001, Physics 1050 (or 1020) and 1051 (or 1021), Biology 1001 and 1002 are highly recommended;
- 3. Mathematics 2000;
- 4. Chemistry 2100, 2210, 2301, 2302, 2400, 2401, 3110, 3211, 4410;
- 5. Nine further credit hours in Chemistry courses numbered 3000 or higher, at least 6 credit hours of which must be in courses numbered 4000 or higher;
- Human Biosciences 2001 (or the former Biochemistry 2101 or 2201), 2002 (or the former Biochemistry 2600), 2003 (or the former Biochemistry 3206), 2004 (or the former Biochemistry 2100 or 2200), 2901;
- 7. Two of Human Biosciences 3001, 3002, 3003, 3004, 3005;

- An additional 12 credit hours to be selected from Human Biosciences 3001, 3002, 3003, 3101, 3906 or 3907, 4002, 4101, 4102, 4104, 4200, 4201, 4210 or 4211, 4230, 4231, 4232;
- 9. Human Biosciences 4800 (Capstone);
- 10. Human Biosciences 499A/B or Chemistry 490A/B; and
- 11. A sufficient number of elective courses to bring the degree to a total of 120 credit hours.

10.2.5 Human Biosciences and Physics Joint Honours

The following courses are required:

- Six credit hours in <u>Critical Reading and Writing (CRW)</u> courses, including at least 3 credit hours in English courses;
- Chemistry 1050 and 1051 (or 1200 and 1001), Mathematics 1000 and 1001, Physics 1050 (or 1020) and 1051;
- 3. Chemistry 2400;
- 4. Chemistry 2301 or Physics 2053;
- 5. Mathematics 2000, 2050, 2260, either Mathematics 3202 or Physics 3810;
- Human Biosciences 2001 (or the former Biochemistry 2101 or 2201), 2002 (or the former Biochemistry 2600) 2003 (or the former Biochemistry 3206), 2004 (or the former Biochemistry 2100 or 2200), 2901 (or Biochemistry 2901);
- 7. Two of Human Biosciences 3001, 3002, 3003, 3004, 3005;
- An additional 9 credit hours to be selected from Human Biosciences 3001, 3002, 3003, 3101 (or Biochemistry 4105), 3105, 3906 or 3907, 4002, 4101, 4102, 4104, 4200, 4201, 4230, 4231, 4232;
- 9. Human Biosciences 4800 (Capstone);
- 10. Physics 2055, 2750 or 2056, 2820, 3220, 3400, 3500, 3750, 3820, 3900, plus one 4000 level Physics course;
- 11. Human Biosciences 499A/B or Physics 490A/B; and
- 12. Other courses to complete the prescribed minimum of 120 credit hours in courses for the Joint Honours degree.

10.2.6 Human Biosciences and Psychology (Behavioural Neuroscience) Joint Honours

Note: Students completing this program cannot receive credit for Psychology 2920. The following courses (or equivalent) are required:

- Six credit hours in <u>Critical Reading and Writing (CRW)</u> courses, including at least 3 credit hours in English courses;
- 2. Chemistry 1050 and 1051 (or 1200 and 1001), Biology 1001 and 1002, Mathematics 1000;
- Human Biosciences 2001 (or the former Biochemistry 2101 or 2201), 2002 (or the former Biochemistry 2600), 2003 (or the former Biochemistry 3206), 2004 (or the former Biochemistry 2100 or 2200), 2901, 3004 and Medicine 310A/B;
- 4. An additional 15 credit hours to be selected from Human Biosciences 3001, 3002, 3003, 3101, 3906 or 3907, 4002, 4101, 4102, 4104, 4200, 4201, 4230, 4231, 4232;
- 5. Human Biosciences 4800 (Capstone);
- 6. Psychology 1000, 1001, 2521, 2910, 2911, 2930, 3800, 3820, 3900;
- Three credit hours in Psychology chosen from the following: the former PSYC 3250, 3810, 3830, 3840, or 3860;
- Three credit hours in Psychology chosen from the following: 3050, 3100, 3251, 3350, 3450, 3620, 3650, 3750;
- 9. Any Psychology research experience course and one of Psychology 4850, 4851, 4852, 4853, or 4854; or, any Psychology selected topics course and Psychology 4870;
- 10. Human Biosciences 499A/B 499A/B or Psychology 499A/B; and
- 11. Chemistry 2400.

1. Students in first year intending to follow this program should note the regulations for admission to Major programs in Psychology and that the deadline for submission of a completed application form to the Department of Psychology is June 1 for the Fall semester.

The proposed calendar entry below lists the Human Biosciences course offerings, denoted with the new abbreviation "HUBI". Most courses are carried over from the Biochemistry offerings. Those denoted by a "*" are <u>new courses</u> that are described in the next section of the proposal.

1x.1 Human Biosciences Program Courses

HUBI 1001 Food, Drugs, and Your Body

(same as Biochemistry 1600) examines the substances humans put into their bodies and the impact the substances have on cellular physiology and metabolism. With a special emphasis on current trends, the course introduces the concept of foods and drugs, how they are metabolised by the body, the social and political implications of foods and drugs, how they can influence overall health, and the sometimes grey areas between foods and drugs.

CR: Biochemistry 1600

HUBI 1430 Biochemistry for Health Professionals

(same as Biochemistry 1430) is an introduction to the chemistry and structure-function relationships of DNA, carbohydrates, lipids and proteins. It will examine the basic metabolism of carbohydrates and fats, with emphasis on the biochemical fluctuations that occur in human health and disease, and will include a brief introduction to molecular genetics. Prospective <u>Bachelor of Science in Nursing (Collaborative)</u> program students should consult with the Faculty of Nursing concerning admission to this course.

CR: Biochemistry 1430 and the former Biochemistry 2430

LC: 4

PR: Level 3 Chemistry or Chemistry 1010 or Chemistry 1810 or equivalent

UL: may not be used for credit to fulfil the requirements for the Human Biosciences major

HUBI 2001 Introduction to Biochemistry

is an introduction to the major macromolecules of living organisms; proteins, nucleic acids, carbohydrates, and lipids: their structure, relationship, and biochemical function. Other topics include: enzymes; the biochemistry of membranes; and an introduction to cellular signalling.

CO: Chemistry 2400

CR: Biochemistry 2101, 2201, Pharmacy 2004, or the former Pharmacy 3110

PR: Chemistry 1051

HUBI 2002 Introduction to Human Nutrition

(same as Biochemistry 2600 and HKR 2600) gives an overview of human nutrition with an emphasis on topics of current interest. Students will gain an understanding of nutrition in the context of health maintenance across the life span. Topics covered will include Canada's Food Guide, nutrient requirements, obesity and weight loss, sports nutrition, and nutrition in the prevention of chronic diseases.

CR: Biochemistry 2600, Human Kinetics and Recreation 2600

*HUBI 2003 Basics of Human Metabolism

examines how we digest, absorb, and metabolize carbohydrates, fats, proteins, and micronutrients. Students will learn the processes involved in human metabolism including glycolysis, the citric acid cycle, amino acid metabolism, the pentose phosphate pathway, fatty acid metabolism, oxidative phosphorylation and ATP synthesis, and triacylglycerol synthesis and storage. These topics will be presented in the context of linking metabolism and health.

CR: Biochemistry 3206, 3106, and Pharmacy 3111

PR: Biology 1001

*HUBI 2004 Fundamentals of Modern Molecular Biology

will introduce the mechanisms by which genomic information is stored, and expressed; and how expression is regulated. Topics will include nucleic acid structures, DNA replication, RNA transcription and splicing, and how proteins are synthesised. Molecular biological techniques, their applications to biotechnology used in the advancement of food and drug development, and the implications for modern living will be discussed.

CR: Biochemistry 2100, 2200 PR: Biology 1001

HUBI 2901 Biochemistry Laboratory

(same as Biochemistry 2901) develops robust basic biochemistry lab skills in the context of a biotechnology project; students purify and characterize a recombinantly expressed enzyme. Students learn skills including safety, pipetting, buffer calculations, making solutions, protein bioinformatics, techniques for protein enrichment, enzyme kinetics measurements and calculations, graphing data, keeping a lab book, teamwork, critical analysis and presentation of their work in several formats. Students may co-author a scientific publication based on their results.

AR: attendance is required in the laboratory component of this course

- CO: Chemistry 2400
- LH: 3
- CR: Biochemistry 2901

PR: Chemistry 1051, Science 1807 and Science 1808

*HUBI 3001 Lipids and Health

covers core concepts of lipids and membranes, particularly as applied to human health and disease. Students will learn classification, structure, reactions, biosynthesis and oxidation of lipids including fatty acids, cholesterol, phospholipids, lipoproteins and other lipid species. Also covered are lipid digestion, absorption and storage, fat soluble vitamins, bile acids and steroid hormones, cell membranes and associated proteins, lipids-barrier interactions such as blood-brain and placenta, vesicular trafficking and an introduction to lipidomics.

PR: HUBI 2003 (or Biochemistry 3206 or 3106 or Pharmacy 3111)

*HUBI 3002 Carbohydrates: Functions in Human Health and Disease

covers concepts of carbohydrates and glycobiology, specifically, their role in sustaining life and maintaining health and preventing disease. Students will learn the classification, structure, function, reactions, biosynthesis, and oxidation of carbohydrates. Additional topics covered include carbohydrate digestion, absorption and storage, roles of vitamins and minerals in the metabolism of carbohydrates, the recognition of specific glycans by proteins, role of glycans in complex biological systems and glycolytic modifications of lipids, proteins, and nucleic acids.

PR: HUBI 2001 (or Biochemistry 2201 or 2101) or Pharmacy 2004 (or the former Pharmacy 3110), HUBI 2003 (or Biochemistry 3206 or 3106) or Pharmacy 3111

*HUBI 3003 Proteins and Health

covers core concepts of amino acids and proteins with a particular focus on their relationship to human health and disease. Students will learn about dietary proteins as sources of amino acids, amino acid requirements, synthesis, structure and function, body protein synthesis, trafficking, translation, posttranslational modifications, and interactions with other proteins, lipids, carbohydrates, nucleic acids and drugs. The course includes protein methodology such as structure determination and prediction, immunohistochemistry, bioinformatics and computational modelling.

PR: HUBI 2001 (or Biochemistry 2201 or 2101) or Pharmacy 2004 (or the former Pharmacy 3110), HUBI 2003 (or Biochemistry 3206 or 3106) or Pharmacy 3111

*HUBI 3004 Cellular Signaling

provides a comprehensive overview of how cellular function adapts to changes in the environment, how this relates to human disease, and examples of how nutrients, therapeutic and illicit drugs, and indigenous medicines interact with signalling cascades. The impact of intracellular signalling on survival, differentiation, and other cellular outputs will be covered. These include, but are not limited to, mineral and vitamin signalling, cytokine and chemokine signalling, gaseous signalling molecules, cyclin-dependent kinases, and receptor signalling pathways.

PR: HUBI 2001 (or Biochemistry 2201 or 2101) or Pharmacy 2004 (or the former Pharmacy 3110), HUBI 2002 (or Biochemistry 2600 or Human Kinetics and Recreation 2600) CR: Biochemistry 3108

***HUBI 3005 Environment-Health Interactions**

will provide a comprehensive overview of the effects and interactions of major environmental factors with human health. Students will learn how exogenous compounds such as food additives, allergens, drugs, toxicants, as well as probiotics, prebiotics and microbiomes interact with and affect human cellular homeostasis. Impacts of food sustainability, food policy, food ecosystems, digital literacy, and lifestyle on populations including indigenous communities will be discussed.

PR: HUBI 2002 (or Biochemistry 2600 or Human Kinetics and Recreation 2600)

HUBI 3052 Food Microbiology

(same as Biochemistry 3052 and Biology 3052) is the study of the microbiology of water and food with regard to the beneficial and detrimental roles of microorganisms on interaction with these systems. Emphasis will be on the microbiology of food, fermentations, food spoilage and food borne vectors of human disease.

CR: Biochemistry 3052, Biology 3052

LH: 3

PR: Biology 3050 and Science 1807 and Science 1808

HUBI 3101 Immunology

(same as Biochemistry 4105, Biology 4200 and Pharmacy 3006 and the former Pharmacy 4105) is an introduction to the cells and organs of the innate and adaptive immune systems. The molecular and cellular basis of allergy, autoimmunity, vaccination and cancer immunology will also be discussed.

CR: Biochemistry 4105, Biology 4200, Pharmacy 3006, the former Pharmacy 3105 or 4105 PR: HUBI 2001 (or Biochemistry 2201 or 2101)

HUBI 3105 Physical Biochemistry

(same as Biochemistry 3105) examines topics such as: types of intermolecular forces in biomolecules; the folding of biomolecules and the role of water; pH, buffers, and ionisation of biomolecules; thermodynamics: equilibria, coupled reactions, transport across membranes and redox reactions; and ligand binding. Other topics will include: size and shape of biomolecules; isotopes in biochemistry; and spectroscopy of biomolecules.

OR: a two hour problem-solving class

CR: Biochemistry 3105

PR: HUBI 2001 (or Biochemistry 2201 or 2101)

HUBI 3207 Nucleic Acid Biochemistry and Molecular Biology

(same as Biochemistry 3207) examines the structure, function and biochemistry of DNA and RNA and the biochemical processes in the flow of information from the gene to protein. These will include: DNA replication, recombination and repair processes; transcription of RNA and RNA splicing; and protein synthesis. The regulation of gene expression will also be covered at an introductory level. The course will also include an introduction to cloning methodology.

CR: Biochemistry 3207 or 3107

PR: HUBI 2001 (or Biochemistry 2201 or 2101), and HUBI 2004 (or Biochemistry 2100 or 2200, or Biology 2250)

HUBI 3402 Food Chemistry

(same as Biochemistry 3402) covers the following topics: water structure and the role of water in chemical reactions and mechanical properties of foods; chemistry and physical properties of carbohydrates, proteins and lipids; oxidative processes in food, food dispersions; pigments and natural colorants; food flavour; enzyme properties, immobilization and applications; enzymic and non-enzymic browning; food phenolics and natural antioxidants; food additives; and chemical changes in foods during processing. LH: 3

CR: Biochemistry 3402

PR: HUBI 2001 (or Biochemistry 2201 or 2101), Chemistry 2400, Science 1807 and Science 1808

HUBI 3600 Sports and Exercise Nutrition

(same as Biochemistry 3600) deals with the specific roles of nutrients in sport and exercise, and the application of nutrition to sport and exercise.

CR: Biochemistry 3600 or the former 4241

PR: HUBI 2002 (or Biochemistry 2600 or Human Kinetics and Recreation 2600), and one of Medicine 310B or Human Kinetics and Recreation 2320

HUBI 3906 Nutritional Biochemistry and Metabolism Laboratory

teaches advanced biochemical lab and critical thinking skills with a focus on metabolism and nutritionrelated biochemistry. Topics may include animal diet formulation, tissue culture, immunoblots, metabolic flux assays, metabolic regulation, nutrient metabolism, metabolomics and metabolic energetics. Students develop their quantitative reasoning, teamwork, and written and oral communication skills. Students may have opportunities to tour lab facilities and to co-author a scientific publication based on their results.

AR: attendance is required in the laboratory component of this course

LH: 3

CR: Biochemistry 3906

PR: HUBI 2003 (or Biochemistry 3206 or 3106, or Pharmacy 3111), HUBI 2901 (or Biochemistry 2901), Science 1807 and Science 1808

HUBI 3907 Molecular Biology Laboratory

(same as Biochemistry 3907) develops biochemical lab and critical thinking skills through a molecular biology focused project. Topics may include restriction digestion, PCR amplification-based techniques, recombinant DNA and plasmid construction, gene expression systems, nucleic acid bioinformatics, and application of high through-put methods in molecular biology. Students develop their quantitative reasoning, teamwork and communication skills (written and oral). Students may have the opportunity to coauthor a peer-reviewed scientific publication based on their results.

AR: attendance is required in the laboratory component of this course

LH: 3

CR: Biochemistry 3907

PR: HUBI 2001 (or Biochemistry 2201 or 2101), HUBI 2004 (or Biochemistry 2100, 2200, or Biology 2250), HUBI 2901 (or Biochemistry 2901), Science 1807 and Science 1808

HUBI 4002 Biochemical Regulation

(same as Biochemistry 4002) examines metabolic regulation at the cellular and multicellular level. Topics will include control theory, biosynthesis and mechanism of action of hormones, signal transduction and endocrine coordination of metabolic processes. Principles are illustrated by the use of case studies from the medical literature.

LC: two to three hours per week, together with assigned reading and case studies

CR: Biochemistry 4002

PR: HUBI 2001 (or Biochemistry 2201 or 2101), HUBI 2003 (or Biochemistry 3206 or 3106), and HUBI 2004 (or Biochemistry 2100 or 2200, or Biology 2250)

HUBI 4101 Proteins

(same as Biochemistry 4101) will review the history of protein research and the general properties of proteins and include other topics such as strategy and methods for purification, chemical structure, properties, modification and determination of the protein amino acids, sequencing strategy, chain cleavage methods and end group analysis; folding of the protein main chain and techniques to determine structure; and the relationship between structure and function: protein filaments, motors and regulators. It will also cover disease-related proteins and other examples from the current literature.

LC: two to three hours per week, together with assigned reading

CR: Biochemistry 4101

PR: HUBI 3003 (or Biochemistry 3105)

HUBI 4104 Eukaryotic Gene Regulation and Developmental Biology

(same as Biochemistry 4104) details the cellular and molecular aspects of eukaryotic gene regulation and development. Topics to be covered will include the DNA content and organization of eukaryotes, mechanisms controlling the expression of eukaryotic genetic information at the transcriptional and post-transcriptional levels, and the methodologies used to define these mechanisms. Detailed consideration will be given to the cell-surface events which regulate nuclear gene expression and cell lineage specification. Developmental mechanisms operating in a number of model systems will be discussed.

CR: Biochemistry 4104

PR: HUBI 3004 (or Biochemistry 3108), and HUBI 3207 (or Biochemistry 3207 or 3107)

*HUBI 4106 Advanced Metabolism

emphasizes the regulation and integration of metabolism across various cells and tissues in states of nutrient excess and deprivation. Topics covered include citric acid cycle, urea cycle, hormonal regulations, cellular glucose sensing, glycogen, lipid and amino acid metabolism, and regulation of oxidative phosphorylation. Additional topics include metabolic flexibility, minor molecules with important impacts on metabolism and metabolic diseases.

PR: HUBI 2003 (or Biochemistry 3206 or 3106)

CR: Biochemistry 3206 or 3106, or Pharmacy 3111

HUBI 4200 Bioenergetics and Biological Oxidation

(same as Biochemistry 4200) examines topics such as: respiration and electron transport; the functional organization of energy transducing membranes; the structure and function of flavoenzymes, cytochromes, iron-sulfur proteins and quinones; enzyme reduction of oxygen; and, free radicals in biological systems.

LC: two to three hours per week and assigned reading

CR: Biochemistry 4200

PR: HUBI 2003 (or Biochemistry 3206 or 3106)

HUBI 4201 Membranes – Structure and Function

(same as Biochemistry 4201) examines the structure of model and biological membranes, the molecular interactions between membrane components and the effects of these interactions on the biophysical and functional properties of membranes. Other topics will include the structure-function of specialized membranous systems, such as lipoprotein, lung surfactant, and lipid rafts; membrane lipid composition in biochemical adaptation and function; and the role of membrane proteins in intracellular trafficking, receptor function, enzymatic activity and membrane-related diseases.

CR: Biochemistry 4201

PR: HUBI 3001 (or Biochemistry 3105)

HUBI 4230 Lipid and Lipoprotein Metabolism

(same as Biochemistry 4230) is designed to provide current knowledge about advances and controversies in lipid and lipoprotein metabolism in the context of health and disease. Topics to be covered include advanced knowledge about lipid and lipoprotein synthesis and regulation, reverse cholesterol transport, plus lipid and lipoprotein utilization to regulate cellular and physiological functions. The covered topics will be related to areas such as reproductive biology, atherosclerosis, AIDS, Alzheimer's, and cancer.

CR: Biochemistry 4230, Biochemistry 6000

PR: HUBI 3001

HUBI 4231 Molecular Biology of the Bacterial-Human Interface

(same as Biochemistry 4231) will explore the molecular biology of the bacteria that inhabit or invade human bodies, how these bacteria get established in humans, the biochemical mechanisms by which some bacterial pathogens can damage the host, and the contest for essential nutrients (e.g. iron) between bacteria and host.

CR: Biochemistry 4231

PR: HUBI 3207 (or Biochemistry 3207 or 3107), or permission of the course instructor

HUBI 4232 Enzymes and Receptors

(same as Biochemistry 4232) provides students with the tools to identify which drug will have more therapeutic benefit or greater risk of toxicity, and how drugs are altered to make them more effective. The majority of approved therapeutics are active due to interactions with either an enzyme or a receptor, and this course will examine how these interactions are studied and quantified to allow comparisons, and how this information directs drug discovery efforts.

CR: Biochemistry 4232

PR: HUBI 2001 (or Biochemistry 2201 or 2101), HUBI 3004 (or Biochemistry 3108)

HUBI 4240 Nutrient-Gene Interactions and Personalized Nutrition

(same as Biochemistry 4240) is designed to provide greater understanding of the relationships between nutrients and the genome, the potential to design personalized diets based on the genetic makeup of an individual and ethical issues. Students will develop an appreciation for the roles of nutrients in direct interactions with genes to regulate metabolic processes, thereby maintaining health and preventing diseases.

CR: Biochemistry 4240

PR: HUBI 2002 (or Biochemistry 2600 or Human Kinetics 2600), HUBI 2003 (or Biochemistry 3206 or 3106), HUBI 2004 (or Biochemistry 2200 or 2100, or Biology 2250),

HUBI 4300 Controversies in Nutrition

(same as Biochemistry 4300) is a course in which current controversies and trends in human nutrition are presented and discussed using the scientific literature.

CR: Biochemistry 4300

PR: HUBI 3001, 3002 and 3003 or the former Biochemistry 3203, and Medicine 310B

HUBI 4301 Nutrition and Disease

(same as Biochemistry 4301) is a course which uses current literature to discuss the relationships between dietary habits, nutritional status and chronic disease risk; the scientific basis for nutritional interventions used in the treatment of chronic diseases commonly affecting Canadians is also part of the course content.

CR: Biochemistry 4301

PR: HUBI 3001, 3002 and 3003 or the former Biochemistry 3203, and Medicine 310B

* HUBI 4800 Human Biosciences Capstone

is a seminar course in which faculty instructors and students will meet to discuss concepts and methods related to the study of human health. Students will have the opportunity to read and critique current literature, discuss the literature with peers, and work with a faculty mentor to design a research protocol relevant to human biosciences.

PR: Restricted to Human Biosciences major and honours students with at least 60 credit hours in courses

HUBI 499A and 499B Dissertation

is the independent study of a problem in life sciences and is obligatory for Honours students in Human Biosciences. Faculty advisors will guide the subject of study which must be approved by the Head of the Department or delegate. The written dissertation shall be submitted by the end of the tenth week of the second semester. At the end of that semester the student will give an oral presentation and answer questions on their study.

CH: 6

OR: Occasional classes will be held to guide and advise students in the preparation of their written reports. Students are expected to attend these classes.

CR: Biochemistry 499A and 499B

PR: Honours students in their final year or permission of the Head; Science 1807 and Science 1808

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Senate Summary Page for Courses

The new courses described below were developed to meet the core program content as set out in the Foundation Pillars established during the curriculum review process (as described in the Rationale section of this proposal).

Table of Contents for Courses Developed for the Human Biosciences Program

- 1. HUBI 2003 Basics of Human Metabolism
- 2. HUBI 2004 Fundamentals of Modern Molecular Biology
- 3. HUBI 3001 Lipids and Health
- 4. HUBI 3002 Carbohydrates: Functions in Human Health and Disease
- 5. HUBI 3003 Proteins and Health
- 6. HUBI 3004 Cellular Signalling
- 7. HUBI 3005 Environment-Health Interactions
- 8. HUBI 4106 Regulation of Metabolism
- 9. HUBI 4800 Human Biosciences Capstone

COURSE NUMBER AND TITLE

HUBI 2003 Basics of Human Metabolism

ABBREVIATED COURSE TITLE

Human Metabolism

RATIONALE

The Department of Biochemistry underwent the Academic Unit Planning review process in early 2020, and over an 18-month period, engaged in a CITL-supported, comprehensive review with a focus on identifying and mapping core concepts and Program Level Outcomes. As a result, a new program with new courses has been developed to address identified gaps and redundancies, and to better match the changing face of the departmental expertise. This proposed course is in response to splitting the previous BIOC 3206 into a more accessible second year course and advanced fourth year course. The course significantly contributes to the foundational biochemical, nutrition, and molecular concepts with a focus on the application of these concepts to human health and disease. It has been designed to be interdisciplinary and will be co-taught by faculty from different disciplinary backgrounds, to ensure that content is presented through an interdisciplinary lens. This course will ensure that students are better prepared for their third-year courses, and will help to meet the demand for undergraduate programming focussed on the molecular basis of human health and disease.

CALENDAR CHANGES

HUBI 2003 Basics of Human Metabolism examines how we digest, absorb, and metabolize carbohydrates, fats, proteins, and micronutrients. Students will learn the processes involved in human metabolism including glycolysis, the citric acid cycle, amino acid metabolism, the pentose phosphate pathway, fatty acid metabolism, oxidative phosphorylation and ATP synthesis, and triacylglycerol synthesis and storage. These topics will be presented in the context of linking metabolism and health.

<u>CR: Biochemistry 3206, 3106, and Pharmacy 3111</u> PR: Biology 1001

CALENDAR ENTRY AFTER CHANGES

HUBI 2003 Basics of Human Metabolism examines how we digest, absorb, and metabolize carbohydrates, fats, proteins, and micronutrients. Students will learn the processes involved in human metabolism including glycolysis, the citric acid cycle, amino acid metabolism, the pentose phosphate pathway, fatty acid metabolism, oxidative phosphorylation and ATP synthesis, and triacylglycerol synthesis and storage. These topics will be presented in the context of linking metabolism and health.

CR: Biochemistry 3206, 3106, and Pharmacy 3111 PR: Biology 1001

SECONDARY CALENDAR CHANGES

[Please refer to the associated new program proposal and changes]

SIMPLE COURSE OUTLINE

(For the full syllabus, please refer to the sample syllabi provided **following this simplified outline**)

Textbook

Candidate textbooks include:

Nelson, D.L, Cox, M.M. & Hoskins, A.A. (2021). *Lehninger Principles of Biochemistry* (8th ed.). W. H. Freeman and Company.

Gropper, S.S., Smith, J.L., & Carr, T.P. (2021). *Advanced nutrition and human metabolism* (8th ed.). Cengage Learning.

Students may already have these texts, or have full access to the online textbooks, as they are required books for other core courses in the Human Biosciences program.

Course Schedule and Topics

Week	Topics	Notes	Evaluations
1	Digestion and absorption of macronutrients	Including protein, carbohydrate, and lipid breakdown through GI tract	Problem Set 1
2	Digestion and absorption of micronutrients	Including vitamin and mineral absorption and metabolism	
3	Integration of metabolism & placement of carbohydrates, proteins/amino acids, and lipids	Gluconeogenesis and lipolysis are briefly touched upon	
4	NADH, NADPH, and FADH2 in biological redox reactions	Beginner level	Problem Set 2
5	Glycolysis	Includes a brief introduction to gluconeogenesis and global regulation tied to energy production. Omits enzyme regulation.	
6	Citric Acid Cycle / Krebs Cycle	Includes only basic introduction to enzyme regulation	Problem Set 3
7	Oxidative phosphorylation & ATP synthesis	Covering only a basic overview of steps within complexes and enzyme regulation	Midterm
8	Midterm Break		
9	Amino acids: urea cycle	Includes only a basic coverage of enzyme regulation	Written Assignment Due
10	Pentose phosphate pathway	Includes only a basic introduction to NADPH synthesis	Problem Set 4
11	Fatty acid synthesis (palmitate)	Includes only a basic introduction to regulation	
12	Triacylglycerol synthesis	Includes only a basic overview of each step and no coverage of regulation	Problem Set 5
----	-----------------------------------	---	----------------------
13	Case studies tied to above topics		Communication Due

Grade Item	Weight	Difficulty Level (1-5 stars)	Notes	Relevant due dates
Problem sets	30%	**	5 total, lowest mark dropped, 4 x 7.5%. Based on lecture content	Due at end of weeks 1, 3, 5, 10 and 12
Current topics in metabolism			Student-directed topic choice. Both	Written paper due at end of
 Written assignment 	15%	****	assignments target a general audience. Two-page written	week 8 Communication
- Public communication	15%	***	article. Communication may be a video, webpage, self-paced online activity, etc.	due last week of term
Midterm	20%	****		During Week 6
Final Exam	20%	****	non-cumulative	Exam Week

Assessment Schedule

Note that 35% of course assessments are scheduled to be completed and returned before the final course drop date

Possible Instructors

Dr. Robert Brown Dr. Sukhinder Cheema Dr. Amy Todd Dr. Scott Harding Dr. Robert Bertolo Dr. Janet Brunton

Other information in the syllabus would be as per the Faculty of Science course syllabus guidelines. See below for an example of the full syllabus.

HUBI 2004 Fundamentals of Modern Molecular Biology

ABBREVIATED COURSE TITLE

Fundamental Molecular Biology

RATIONALE

The Department of Biochemistry engaged in a thorough review and evaluation of its entire curriculum and content organization in 2021-22. The review involved identifying core concepts at all levels, and identifying in what courses those concepts should be taught. One outcome of the exercise was the need to modify the content of the former course Biochemistry 2200. Specifically, our review indicated that coverage of classical/Mendelian genetics should be reduced from 40-50% to ~10% with a concomitant increase in the molecular biology content to cover topics such as RNA splicing, noncoding RNA, the application of molecular biology in GMOs, the connection between dietary intake and gene regulation, and new applications of molecular biology (e.g. RNAi, CRISPR/Cas genome editing) so that our students will have a broader preparation for their third-year courses.

CALENDAR CHANGES

HUBI 2004 Fundamental Molecular Biology will introduce the mechanisms by which genomic information is stored and expressed; and how expression is regulated. Topics will include nucleic acid structures, DNA replication, RNA transcription and splicing, and how proteins are synthesised. Molecular biological techniques, their applications to biotechnology used in the advancement of food and drug development, and the implications for modern living will be discussed. CR: Biochemistry 2100, 2200

PR: Biology 1001

CALENDAR ENTRY AFTER CHANGES

HUBI 2004 Fundamental Molecular Biology will introduce the mechanisms by which genomic information is stored and expressed; and how expression is regulated. Topics will include nucleic acid structures, DNA replication, RNA transcription and splicing, and how proteins are synthesised. Molecular biological techniques, their applications to biotechnology, and the implications for modern living will be discussed.

CR: Biochemistry 2100, 2200 PR: Biology 1001

SECONDARY CALENDAR CHANGES

[Please refer to the associated new program proposal and changes]

SIMPLE COURSE OUTLINE

(For an example of a full syllabus, please refer to the sample syllabi provided for the proposed HUBI 2003 Basics of Human Metabolism)

Textbook

Candidate textbooks include:

Sanders, M.F. & Bowman, J.L. (2019). *Genetic Analysis: An Integrated Approach* (3rd edition). Pearson. ISBN 9780135194089 (also available as Modified Mastering Genetics with Pearson eText -- Standalone Access Card -- for Genetic Analysis: An Integrated Approach, 3/E ISBN 9780134839639)

Meneely, P. (2020). *Genetic Analysis: Genes, Genomes, and Networks in Eukaryotes* (3rd edition.). Oxford University Press. ISBN-13: 9780198809906

Meneely, P., Hoang, RD., Okeke, I.N., & Heston, K. (2018). *Genetics: Genes, Genomes, and Evolution*. Oxford and New York: Oxford University Press. ISBN-13: 9780198795360

Cox, M.M., Doudna, J., O'Donnell, M. (2015). *Molecular Biology: Principles and Practice* (2nd edition). W. H. Freeman. 9781319154134

Krebs, J.E., Goldstein, E.S., Kilpatrick, S.T. (2021). *Lewin's Essential Genes* (4th ed.). Jones and Bartlett Learning. ISBN: 9781284173130

Week	Topics	Notes	Important Dates
1	DNA Structure and Organization	The molecular structure of DNA; The organization of DNA in chromosomes; The biochemistry of DNA synthesis	
2	Replication and Repair	The replication of genetic material; Mutations & How they arise; DNA Repair; Recombination between DNA molecules;	Quiz #1
3	Genetic Inheritance	Basics of Mendelian Genetics; Basic Patterns of	Quiz #2

		Genetic Inheritance	
4	Transcription (Part 1)	The biochemistry of RNA synthesis; Transcription in Bacteria	Quiz #3
5	Transcription (Part 2)	Transcription in Eukaryotes; RNA Splicing in Eukaryotes	Quiz #4
6	The History of the Genetic Code	The Genetic Code & how it was determined	Midterm
7	Translation and Protein Synthesis	The biochemistry of protein synthesis;	Quiz #5
8	Midterm Break		
9	Gene Expression and Regulation	Regulation of Gene Expression in Bacteria and Eukaryotes; DNA methylation & histone modifications; small RNAs in gene expression	Quiz #6
10	Cloning, Genetic Engineering, and Genome Editing	Plasmids, fundamentals of DNA cloning; In vivo Genetic Engineering; CRISPR-Cas genome editing	Quiz #7
11	Bioinformatics and OMICS	Bioinformatics and methods of analysis; The OMICS revolutions	Quiz #8
12	Molecular Biology and Human Health	Genetically modified crops/food (GMOs); dietary intake and gene expression	
13	Molecular Biology and Society		

Assessment

Grade Item	Weight	Notes	Relevant due dates
Quizzes	20%	8 total (2.5% each)	Weeks 2-5, and 7-11
Class Participation (clickers, discussion, reflection, etc.)	10%		
Midterm	30%		During Week 6
Final Exam	40%	10% from pre-midterm, 30% from after midterm	TBD (During Exam Week)

Assessment Schedule

Note that 40% of course assessments are scheduled to be completed and returned before the final course drop date

Possible Instructors

Dr. Sukhinder K. Cheema Dr. Sherri Christian Dr. Pavan Kakumani Dr. Amy Todd Dr. Martin Mulligan

HUBI 3001 Lipids and Health

ABBREVIATED COURSE TITLE

Lipids & Health

RATIONALE

The Department of Biochemistry underwent the Academic Unit Planning review process in early 2020, and over an 18-month period, engaged in a CITL-supported, comprehensive review with a focus on identifying and mapping core concepts and Program Level Outcomes. As a result, a new program with new courses has been developed to address identified gaps and redundancies, and to better match the changing face of the departmental expertise. This proposed course significantly builds on foundational biochemical, nutrition, and molecular knowledge with a focus on the application of these concepts to human health and disease. It has been designed to be interdisciplinary and will be co-taught by faculty from different disciplinary backgrounds, to ensure that content is presented through an interdisciplinary lens. This course will ensure that students are better prepared for their fourth-year courses, and will help to meet the demand for undergraduate programming focussed on the molecular basis of human health and disease.

CALENDAR CHANGES

HUBI 3001 Lipids and Health covers core concepts of lipids and membranes, particularly as applied to human health and disease. Students will learn classification, structure, reactions, biosynthesis and oxidation of lipids including fatty acids, cholesterol, phospholipids, lipoproteins and other lipid species. Also covered are lipid digestion, absorption and storage, fat soluble vitamins, bile acids and steroid homones, cell membranes and associated proteins, lipids-barrier interactions such as blood-brain and placenta, vesicular trafficking and an introduction to lipidomics.

PR: HUBI 2003 (or Biochemistry 3206 or 3106) or Pharmacy 3111

CALENDAR ENTRY AFTER CHANGES

HUBI 3001 Lipids and Health covers core concepts of lipids and membranes, particularly as applied to human health and disease. Students will learn classification, structure, reactions, biosynthesis, and oxidation of lipids including, but not limited to fatty acids, cholesterol, phospholipids, and lipoproteins. Also covered is lipid digestion, absorption and storage, fat soluble vitamins, bile acids and steroid homones, cell membranes and associated proteins, lipids and the blood-brain barrier, vesicular trafficking and an introduction to lipidomics.

PR: HUBI 2003 (or Biochemistry 3206 or 3106) or Pharmacy 3111

SECONDARY CALENDAR CHANGES

[Please refer to the associated new program proposal and changes]

SIMPLE COURSE OUTLINE

(For an example of a full syllabus, please refer to the sample syllabi provided for the proposed HUBI 2003 Basics of Human Metabolism)

Textbooks

Gropper, S.S., Smith, J.L., & Carr, T.P. (2021). *Advanced Nutrition and Human Metabolism* (8th ed.). Cengage Learning.

(*Recommended*) Nelson, D.L, Cox, M.M. & Hoskins, A.A. (2021). *Lehninger Principles of Biochemistry* (8th ed.). W. H. Freeman and Company.

Students may already have these texts, or have full access to the online textbooks, as they are required books for other core courses in the Human Biosciences program.

Week	Topic (approx. 1 topic per week)
1	Digestion and absorption & storage of lipids (intermediate), Vitamins A, E, and K
2	Fatty acids and triacylglycerols: classification, structure, reactions (intermediate); energy storage (e.g. triacylglycerol storage) and release (intermediate)
3	Fatty acid synthesis (basic/intermediate), oxidation (basic)
4	Cholesterol: structure, biosynthesis, functions (intermediate), Vitamin D
5	Sterols: steroid hormones, bile acids, functions (intermediate),
6	Phospholipids: nomenclature, classification, structure, synthesis (intermediate)
7	Fatty alcohols, fatty aldehydes, ketones, waxes, terpenes and fat soluble vitamins (Basic)
8	Lipoproteins/lipid transport (intermediate), Fat-soluble vitamins
9	Membranes (intermediate) and membrane proteins

10	Barriers (e.g. blood-brain, blood-placenta)
11	Vesicular trafficking (intermediate), extracellular vesicles (basic)
12	Lipidomics (basic)
13	Additional week for contingencies

Assessment

Grade Item	Weight	Notes	Relevant due dates
Quizzes	30%	4 total, non-cumulative, lowest quiz mark will be dropped, 10% each	Weeks 3, 6, 8,11
In-Class Participation	10%	e.g., clicker questions, short paper reflections to hand in, peer critiquing	TBD
Presentation	15%	e.g., Infographic with oral presentation (group) on one course topic	Week 6
Explainer	15%	Written assignment (e.g., Wiki, blog) that takes a course-related issue and explains it for the general public	Week 10
Final Exam	30%	Cumulative	During Exam Week

Assessment Schedule

Note that 35% of course assessments are scheduled to be completed and returned before the final course drop date (end of week 8).

Possible Instructors

- Dr. Valerie Booth
- Dr. Robert Brown
- Dr. Sukhinder K. Cheema
- Dr. Zahra Farahnak
- Dr. Scott Harding
- Dr. Fereidoon Shahidi

HUBI 3002 Carbohydrates: Functions in Human Health and Disease

ABBREVIATED COURSE TITLE

Carbohydrates & Health

RATIONALE

The Department of Biochemistry underwent the Academic Unit Planning review process in early 2020, and over an 18-month period, engaged in a CITL-supported, comprehensive review with a focus on identifying and mapping core concepts and Program Level Outcomes. As a result, a new program with new courses has been developed to address identified gaps and redundancies, and to better match the changing face of the departmental expertise. This proposed course addresses gaps in material describing carbohydrate functions that are separate from energy metabolism. Furthermore, it significantly builds on foundational biochemical, nutrition, and molecular knowledge with a focus on the application of these concepts to human health and disease. It has been designed to be interdisciplinary and will be co-taught by faculty from different disciplinary backgrounds, to ensure that content is presented through an interdisciplinary lens. This course will ensure that students are better prepared for their fourth-year courses, and will help to meet the demand for undergraduate programming focussed on the molecular basis of human health and disease.

CALENDAR CHANGES

HUBI 3002 Carbohydrates: Functions in Human Health and Disease covers concepts of carbohydrates and glycobiology, specifically, their role in sustaining life and maintaining health and preventing disease. Students will learn the classification, structure, function, reactions, biosynthesis, and oxidation of carbohydrates. Additional topics covered include carbohydrate digestion, absorption and storage, roles of vitamins and minerals in the metabolism of carbohydrates, the recognition of specific glycans by proteins, role of glycans in complex biological systems and glycolytic modifications of lipids, proteins, and nucleic acids.

PR: HUBI 2001 (or Biochemistry 2201 or 2101) or Pharmacy 2004 (or the former Pharmacy 3110), HUBI 2003 (or Biochemistry 3206 or 3106) or Pharmacy 3111

CALENDAR ENTRY AFTER CHANGES

HUBI 3002 Carbohydrates: Functions in Human Health and Disease covers concepts of carbohydrates and glycobiology, specifically, their role in sustaining life and maintaining health and preventing disease. Students will learn the classification, structure, function, reactions, biosynthesis, and oxidation of carbohydrates. Additional topics covered include carbohydrate digestion, absorption and storage, roles of vitamins and minerals in the metabolism of carbohydrates, the recognition of specific glycans by proteins, role of glycans in complex biological systems and glycolytic modifications of lipids, proteins, and nucleic acids.

PR: HUBI 2001 (or Biochemistry 2201 or 2101) or Pharmacy 2004 (or the former Pharmacy 3110), HUBI 2003 (or Biochemistry 3206 or 3106) or Pharmacy 3111

SECONDARY CALENDAR CHANGES

[Please refer to the associated new program proposal and changes]

SIMPLE COURSE OUTLINE

(For an example of a full syllabus, please refer to the sample syllabi provided for the proposed HUBI 2003 Basics of Human Metabolism)

Textbook

(*Recommended; open source*) Varki, A., Cummings, R. D., Esko, J. D., Stanley, P., Hart, G. W., Aebi, M., Mohnen, D., Kinoshita, T., Packer, N., Prestegard, J., Schnaar, R. L., & Seeberger, P. H. (2022) *Essentials of Glycobiology* (Fourth edition.). Cold Spring Harbor Laboratory Press.

(*Recommended*) Gropper, S.S., Smith, J.L., & Carr, T.P. (2021). *Advanced Nutrition and Human Metabolism* (8th ed.). Cengage Learning.

(*Recommended*) Nelson, D.L, Cox, M.M. & Hoskins, A.A. (2021). *Lehninger Principles of Biochemistry* (8th ed.). W. H. Freeman and Company.

Students may already have Nelson *et al.*, and/or Gropper *et al.*, or have full access to the online textbooks, as they are required books for other core courses in the Human Biosciences program.

Week	Topic (approx. 1 topic per week)
1	Biological importance of carbohydrates, nomenclature & classification
2	Fischer structure, ring structure, reactivity, (stereo)isomers
3	Digestion and absorption of carbohydrates
4	Sugar transporters
5	Glycosidic bond & storage of carbohydrates
6	Oligosaccharides and polysaccharides - disaccharides to starches and fibre
7	Glycan processing enzymes (synthesis and degradation)
8	Glycosylation of biomolecules (proteins, nucleic acids and lipids including LPS)
9	Glycan binding proteins (Lectins)
10	Proteoglycans
11	Micronutrients important in carbohydrate metabolism
12	Health aspects of carbohydrates, including integration of carbohydrate metabolism
13	Additional week for contingencies

|--|

Grade Item	Weight	Notes	Relevant due dates
Quizzes	30%	6 quizzes, 6% each, drop lowest	Weeks 2,4,6,8,10,12
In-Class Participation	10%	e.g., clicker questions, short paper reflections to hand in, peer critiquing	TBD
Case Studies	20%	Individual and group	Weeks 4,8
Midterm	20%	Approx. 50% of course material	TBD
Final Exam	20%	Non-cumulative, from midterm forward	During Exam Week

Assessment Schedule

Note that 48% of course assessments are scheduled to be completed and returned before the final course drop date (prior to week 8)

Possible Instructors

- Dr. Sukhinder K. Cheema
- Dr. Scott Harding
- Dr. Pavan Kakumani
- Dr. Shyamchand Mayengbam
- Dr. Katie Wilson

HUBI 3003 Proteins and Health

ABBREVIATED COURSE TITLE

Proteins & Health

RATIONALE

The Department of Biochemistry underwent the Academic Unit Planning review process in early 2020, and over an 18-month period, engaged in a CITL-supported, comprehensive review with a focus on identifying and mapping core concepts and Program Level Outcomes. As a result, a new program with new courses has been developed to address identified gaps and redundancies, and to better match the changing face of the departmental expertise. This proposed course significantly builds on foundational biochemical, nutrition, and molecular knowledge with a focus on the application of these concepts to human health and disease. It has been designed to be interdisciplinary and will be co-taught by faculty from different disciplinary backgrounds, to ensure that content is presented through an interdisciplinary lens. This course will ensure that students are better prepared for their fourth-year courses, and will help to meet the demand for undergraduate programming focussed on the molecular basis of human health and disease.

CALENDAR CHANGES

HUBI 3003 Proteins and Health covers core concepts of amino acids and proteins with a particular focus on their relationship to human health and disease. Students will learn about dietary proteins as sources of amino acids, amino acid requirements, synthesis, structure and function, body protein synthesis, trafficking, translation, post-translational modifications, and interactions with other proteins, lipids, carbohydrates, nucleic acids and drugs. The course includes protein methodology such as structure determination and prediction, immunohistochemistry, bioinformatics and computational modelling.

PR: HUBI 2001 (or Biochemistry 2201 or 2101) or Pharmacy 2004 (or the former Pharmacy 3110), HUBI 2003 (or Biochemistry 3206 or 3106) or Pharmacy 3111

CALENDAR ENTRY AFTER CHANGES

HUBI 3003 Proteins and Health covers core concepts of amino acids and proteins with a particular focus on their relationship to human health and disease. Students will learn about dietary proteins as sources of amino acids, amino acid requirements, synthesis, structure and function, body protein synthesis, trafficking, translation, post-translational modifications, and interactions with other proteins, lipids, carbohydrates, nucleic acids and drugs. The course includes protein methodology such as structure determination and prediction, immunohistochemistry, bioinformatics and computational modelling.

PR: HUBI 2001 (or Biochemistry 2201 or 2101) or Pharmacy 2004 (or the former Pharmacy 3110), HUBI 2003 (or Biochemistry 3206 or 3106) or Pharmacy 3111

SECONDARY CALENDAR CHANGES

[Please refer to the associated new program proposal and changes]

SIMPLE COURSE OUTLINE

(For an example of a full syllabus, please refer to the sample syllabi provided for the proposed HUBI 2003 Basics of Human Metabolism)

Textbook

(*Recommended*) Gropper, S.S., Smith, J.L., & Carr, T.P. (2021). *Advanced Nutrition and Human Metabolism* (8th ed.). Cengage Learning.

(*Recommended*) Nelson, D.L, Cox, M.M. & Hoskins, A.A. (2021). *Lehninger Principles of Biochemistry* (8th ed.). W. H. Freeman and Company.

Students may already have these texts, or have full access to the online textbooks, as they are required books for other core courses in the Human Biosciences program.

Week	Topic(s)
1	Dietary proteins/peptides; digestion, absorption, dietary protein quality (Intermediate)
2	Amino acid requirements, synthesis and breakdown (Intermediate)
3	Non-protein amino acid functions (Intermediate), inter-organ metabolism, in-born errors of metabolism, protein deficiency diseases
4	Protein structural elements (including thermodynamics concepts needed to understand these) with examples of protein function (e.g., disease-causing mutations in globular proteins, membrane proteins and intrinsically disordered proteins) (Intermediate)
5	Protein structural elements (including thermodynamics concepts needed to understand these) with examples of protein function (e.g., enzymes, misfolding diseases) (Intermediate)
6	Protein synthesis (Intermediate) including endoplasmic reticulum and golgi, protein trafficking
7	Translation regulation (Intermediate)

8	Post-translational modifications (Intermediate)
9	Protein interactions including protein-protein and protein-lipid, (Intermediate) along with more protein function
10	Protein interactions including protein-carb and protein-small molecules (Intermediate) along with more protein function
11	Protein methods (Basic/Intermediate) including structure determination, immunohistochemistry
12	Protein methods (Basic/Intermediate) including making multiple sequence alignments, folding/structure prediction, computational modelling
13	Additional week for contingencies

Assessment

Grade Item	Weight	Notes	Relevant due dates
Learning Reflections	30%	Biweekly learning reflection activity (written, 6 total, 5% each) e.g., Content summary, challenge areas, integration/application of course material	Weeks 2,4,6,8,10,12
Quizzes	40%	Biweekly quizzes (5 quizzes, 10% each) Lowest quiz mark will be dropped	Weeks 3,5,6,9,11
Student- directed communication	15%	Choice of oral, written or infographic. Topics may focus on careers, debunking, EDI, etc.	TBD
Bioinformatics worksheet	15%		TBD

Assessment Schedule

Note that 30% of course assessments are scheduled to be completed and returned before the final course drop date

Possible Instructors

Dr. Robert Bertolo Dr. Valerie Booth Dr. Janet Brunton Dr. Jaeok Park Dr. Amy Todd Dr. Katie Wilson

HUBI 3004 Cellular Signalling

ABBREVIATED COURSE TITLE

Cellular Signalling

RATIONALE

The Department of Biochemistry underwent the Academic Unit Planning review process in early 2020, and over an 18-month period, engaged in a CITL-supported, comprehensive review with a focus on identifying and mapping core concepts and Program Level Outcomes. As a result, a new program with new courses has been developed to address identified gaps and redundancies, and to better match the changing face of the departmental expertise. This proposed course significantly builds on foundational biochemical, nutrition, and molecular knowledge with a focus on the application of these concepts to human health and disease. It has been designed to be interdisciplinary and will be co-taught by faculty from different disciplinary backgrounds, to ensure that content is presented through an interdisciplinary lens. This course will ensure that students are better prepared for their fourth-year courses, and will help to meet the demand for undergraduate programming focussed on the molecular basis of human health and disease.

CALENDAR CHANGES

HUBI 3004 Cellular Signalling provides a comprehensive overview of how cellular function adapts to changes in the environment, how this relates to human disease, and examples of how nutrients, therapeutic and illicit drugs, and indigenous medicines interact with signalling cascades. The impact of intracellular signalling on survival, differentiation, and other cellular outputs will be covered. These include, but are not limited to, mineral and vitamin signalling, cytokine and chemokine signalling, gaseous signalling molecules, cyclin-dependent kinases, and receptor signalling pathways.

PR: HUBI 2001 (or Biochemistry 2201 or 2101) or Pharmacy 2004 (or the former Pharmacy 3110), HUBI 2002 (or Biochemistry 2600 or Human Kinetics 2600) CR: Biochemistry 3108

CALENDAR ENTRY AFTER CHANGES

HUBI 3004 Cellular Signalling provides a comprehensive overview of how cellular function adapts to changes in the environment, how this relates to human disease, and examples of how nutrients, therapeutic and illicit drugs, and indigenous medicines interact with signalling cascades. The impact of intracellular signalling on survival, differentiation, and other cellular outputs will be covered. This includes, but is not limited to, mineral and vitamin signalling, cytokine and chemokine signalling, gaseous signalling molecules, cyclin-dependent kinases, and receptor signalling pathways.

PR: HUBI 2001 (or Biochemistry 2201 or 2101) or Pharmacy 2004 (or the former Pharmacy 3110), HUBI 2002 (or Biochemistry 2600 or Human Kinetics 2600)

CR: Biochemistry 3108

SECONDARY CALENDAR CHANGES

[Please refer to the associated new program proposal and changes]

SIMPLE COURSE OUTLINE

(For an example of a full syllabus, please refer to the sample syllabi provided for the proposed HUBI 2003 Basics of Human Metabolism)

Textbook

There is no specific textbook for this course. The course will make use of primary literature which will be provided via library links through the course Brightspace shell.

(*Recommended; free access through MUN Library*) Brunton L, Knollmann, B. C., & Hilal-Dandan, R. (2018). *Goodman & Gilman's: The Pharmacological Basis of Therapeutics* (13th ed.). McGraw-Hill Education LLC.

(*Recommended*) Gropper, S.S., Smith, J.L., & Carr, T.P. (2021). *Advanced Nutrition and Human Metabolism* (8th ed.). Cengage Learning.

(*Recommended*) Nelson, D.L, Cox, M.M. & Hoskins, A.A. (2021). *Lehninger Principles of Biochemistry* (8th ed.). W. H. Freeman and Company.

Students may already have Nelson *et al.*, and/or Gropper *et al.*, or have full access to the online textbooks, as they are required books for other core courses in the Human Biosciences program.

Week	Topics	Important Dates
1	Basics of hormonal and neuronal signalling Pharmacology vs Toxicology: It's all in the dose	
2	G protein coupled receptors (Gs & Gi; Gq/11; G12/13; arrestin cascades; calcium/PKC cascade)	
3	G protein coupled receptors (representative examples. – adrenergic,	Quiz 1

	eicosanoids, glucagon, ghrelin, endocannabinoids, opioids, estrogen)		
4	Nuclear Hormone receptors (representative examples – estrogen, progesterone, vitamin D, thyroid hormone)		
E	Nuclear hormone receptors		
5	(signal transduction links to cellular, organ, and whole body effects)	Quiz 2	
	Mineral and Vitamin Signalling		
6	(Iron, copper, pyridoxine, riboflavin, niacin, vitamin B12,folic acid, vitamin E)	Educational Video Due	
7	Midterm Break		
	Tyrosine kinase receptors		
8	(Jak/STAT; Ras/MEK/ERK; PI-3- kinase/Akt/mTORC cascades)		
q	Tyrosine kinase receptors	Quiz 3	
	(representative examples – insulin, EGF, trkA)		
10	Death receptors		
	(Apoptosis, pyroptosis, ferroptosis)		
11	Development and differentiation	Quiz 4	
	(Cyclin-dependent kinases, Jun, c-fos, p53)		
12	Cytokine and chemokine signalling		
	(Leptin, TNF)		
13	Gaseous signalling molecules	Case Study Due	
	(NO, H ₂ S, CO)		

Assessment

Grade Item	Weight	Notes	Relevant due dates
Quizzes x 4 (5% each)	20%	GPCR, nuclear receptors, Tyrosine kinase receptors, cell death & differentiation	2 completed before 20% drop date
Video Communication	20%	Group work. 5 min YouTube-type general public educational video on use and mechanisms of a drug, health supplement, or indigenous preparation.	Week 6
Case Study	20%	Group work. Based on second half of course. One- page scientific assessment.	Last week of term
Midterm	20%		Completed before 20% drop date
Final Exam	20%	non-cumulative	During Exam Week

Assessment Schedule

Note that 30% of course assessments are scheduled to be completed and returned before the final course drop date

Possible Instructors

Dr. Mark D. Berry Dr. Janet Brunton Dr. Sherri Christian Dr. Shyamchand Mayengbam Dr. Jaeok Park Dr. Amy Todd

HUBI 3005 Environment-Health Interactions

ABBREVIATED COURSE TITLE

Enviro-Health Interactions

RATIONALE

The Department of Biochemistry underwent the Academic Unit Planning review process in early 2020, and over an 18-month period, engaged in a CITL-supported, comprehensive review with a focus on identifying and mapping core concepts and Program Level Outcomes. As a result, a new program with new courses has been developed to address identified gaps and redundancies, and to better match the changing face of the departmental expertise. This proposed course significantly builds on foundational biochemical, nutrition, and molecular knowledge with a focus on the application of these concepts to human health and disease. It has been designed to be interdisciplinary and will be co-taught by faculty from different disciplinary backgrounds, to ensure that content is presented through an interdisciplinary lens. This course will ensure that students are better prepared for their fourth-year courses, and will help to meet the demand for undergraduate programming focussed on the molecular basis of human health and disease.

CALENDAR CHANGES

HUBI 3005 Environment-Health Interactions will provide a comprehensive overview of the effects and interactions of major environmental factors with human health. Students will learn how exogenous compounds such as food additives, allergens, drugs, toxicants, as well as probiotics, prebiotics and microbiomes interact with and affect human cellular homeostasis. Impacts of food sustainability, food policy, food ecosystems, digital literacy, and lifestyle on populations including indigenous communities will be discussed.

PR: HUBI 2002 (or Biochemistry 2600 or Human Kinetics and Recreation 2600)

CALENDAR ENTRY AFTER CHANGES

HUBI 3005 Environment-Health Interactions will provide a comprehensive overview of the effects and interactions of major environmental factors with human health. Students will learn how exogenous compounds such as food additives, allergens, drugs, toxicants, as well as probiotics, prebiotics and microbiomes interact with and affect human cellular homeostasis. Impacts of food sustainability, food policy, food ecosystems, digital literacy, and lifestyle on populations including indigenous communities will be discussed.

PR: HUBI 2002 (or Biochemistry 2600 or Human Kinetics and Recreation 2600)

SECONDARY CALENDAR CHANGES

[Please refer to the associated new program proposal and changes]

SIMPLE COURSE OUTLINE

(For an example of a full syllabus, please refer to the sample syllabi provided for the proposed HUBI 2003 Basics of Human Metabolism)

Textbook

There is no specific textbook for this course. The course will make use of primary literature library links to which will be provided through the course Brightspace shell.

Week	Topics
1	Environmental/Exogenous Factors 1: Overview on health & environment interactions (basic), food additives, preservatives (intermediate)
2	Environmental/Exogenous Factors 2: Allergens/allergenicity (basic/intermediate), xenobiotic/drug metabolism (phases) (intermediate), drug-food interaction
3	Environmental/Exogenous Factors 3: Pollutants, toxicants and toxicology (intermediate)
4	Food ecosystem 1: Conventional and organic foods, GMO, processed foods (intermediate)
5	Food ecosystem 2: Economics, sustainability and supply, impacts of climate change (intermediate)
6	Food ecosystem 3: Nutrition/food policy (basic), population nutrition (intermediate), indigenous food habits (basic)
7	Midterm Break
8	Reflection/Discussion
9	Microbiome 1: Gram (+) & (-), microbiota constitutive, diversity (basic)
10	Microbiome 2: Microbial metabolites (toxins & beneficial), biofilms, antimicrobial resistance (intermediate)
11	Microbiome 3: Probiotics & prebiotics, immunity, microbial metabolite-host interactions (intermediate)
12	Lifestyle 1: Physical activity; screen time; sleep (intermediate) in the context of health and disease

13	Lifestyle 2: Mental health; digital literacy (information/misinformation sources) (basic)				
Assessment					
Grade	Item	Weight	Notes	Relevant dates	
Quizzes x 4 (5% 20% each)		20%	 Exogenous compounds Food habit, security and policy Microbiome, biofilms lifestyle, digital literacy 	Two to be completed before 20% drop date	
Communications 15% Group Project		15%	Groups choose topic of interest related to food, nutrition, health or environment policies / news / recommendations. Groups submit 2-page assignment OR presentation reflecting the background, impact, and usefulness of the policy / news / recommendations.		
Infographic 10%		10%	Group work to explain a course- related issue with short messages and pictures to the general audience with possibility to present to the public		
Class I	Participation	10%	Students will be graded based on the involvement of the student during case study and usual class discussion through clicker questions.		
Midterr	n	20%	Focus on integration of material, such as risk of natural toxicants with conventional versus organic foods (for example)	To be completed before 20% drop date	

Final Exam	25%	non-cumulative	During Exam Week

Assessment Schedule

Note that 40% of course assessments are scheduled to be completed and returned before the final course drop date

Possible Instructors

Dr. Mark D. Berry Dr. Robert Bertolo Dr. Zahra Farahnak Dr. Pavan Kakumani Dr. Shyamchand Mayengbam Dr. Martin Mulligan

HUBI 4106 Regulation of Metabolism

ABBREVIATED COURSE TITLE

Regulation of Metabolism

RATIONALE

The Department of Biochemistry underwent the Academic Unit Planning review process in early 2020, and over an 18-month period, engaged in a CITL-supported, comprehensive review with a focus on identifying and mapping core concepts and Program Level Outcomes. As a result, a new program with new courses has been developed to address identified gaps and redundancies, and to better match the changing face of the departmental expertise. This proposed course is a consequence of splitting the previous BIOC 3206 into a more accessible second year course and an advanced fourth year course. The course significantly builds on foundational biochemical, nutrition, and molecular knowledge with a focus on the application of these concepts to human health and disease. It has been designed to be interdisciplinary and will be co-taught by faculty from different disciplinary backgrounds, to ensure that content is presented through an interdisciplinary lens. This course will ensure that students are better prepared for their future careers, and will help to meet the demand for undergraduate programming focussed on the molecular basis of human health and disease.

CALENDAR CHANGES

HUBI 4106 Regulation of Metabolism is an advanced course on human metabolism. The course emphasis is on the regulation and integration of metabolism across various cells and tissues in states of nutrient excess and deprivation. Topics covered include citric acid cycle, urea cycle, hormonal regulations, cellular glucose sensing, glycogen, lipid and amino acid metabolism, and regulation of oxidative phosphorylation. Additional topics include metabolic flexibility, minor molecules with important impacts on metabolism and metabolic diseases.

PR: HUBI 2003 (or Biochemistry 3206 or 3106) CR: Biochemistry 3206 or 3106, or Pharmacy 3111

CALENDAR ENTRY AFTER CHANGES

HUBI 4101 Regulation of Metabolism is an advanced metabolism course covering the regulation of human metabolism. The course emphasis is on the regulation and integration of metabolism across various cells and tissues in states of nutrient excess and deprivation. Topics covered include citric acid cycle, urea cycle, hormonal regulations, cellular glucose sensing, glycogen, lipid and amino acid metabolism, and regulation of oxidative phosphorylation. Additional topics include metabolic flexibility, minor molecules with important impacts on metabolism and metabolic diseases.

PR: HUBI 2003 (or Biochemistry 3206 or 3106)

CR: Biochemistry 3206 or 3106, or Pharmacy 3111

SECONDARY CALENDAR CHANGES

[Please refer to the associated new program proposal and changes]

SIMPLE COURSE OUTLINE

(For an example of a full syllabus, please refer to the sample syllabi provided for the proposed HUBI 2003 Basics of Human Metabolism)

Textbook

There is no specific textbook for this course. The course will make use of primary literature which will be provided via library links through the course Brightspace shell.

(*Recommended*) Nelson, D.L, Cox, M.M. & Hoskins, A.A. (2021). *Lehninger Principles of Biochemistry* (8th ed.). W. H. Freeman and Company.

(*Recommended*) Gropper, S.S., Smith, J.L., & Carr, T.P. (2021). *Advanced Nutrition and Human Metabolism* (8th ed.). Cengage Learning.

Students may already have these texts, or have full access to the online textbooks, as they are required books for other core courses in the Human Biosciences program.

Week	Topic (approx. 1 topic per week)
1	Review of the core concepts of glycolysis, citric acid cycle, oxidative phosphorylation.
2	Key regulation steps of the citric acid cycle and urea cycle.
3	Regulation and integration of metabolism in the absorptive state – hormonal controls and cellular glucose sensing.
4	Regulation and integration of metabolism in the absorptive state – glycogen synthesis and lipid synthesis and lipoproteins.
5	Quiz and group work case studies
6	Regulation and integration of metabolism in late postprandial period and hypoglycemia – hormonal controls and glycogen degradation in muscle and liver.

7	Regulation and integration of metabolism in postabsorptive state – lipoproteins, catabolism of lipids and amino acids, regulation of gluconeogenesis, regulation of beta-oxidation.
8	Regulation and integration of metabolism in fasting states – regulation of metabolism in prolonged fasting, adaptations to starvation, regulation of ketone body production and oxidation.
9	Quiz and group work case studies
10	Regulation of oxidative phosphorylation – mitochondrial membrane protein complexes, proton-motive force, mitochondrial membrane transport.
11	Important molecules and drugs affecting metabolism.
12	Metabolic flexibility and adaptations – adaptive thermogenesis, adaptations to exercise training
13	Historical and recent metabolic diseases – Diabetes, inborn errors of metabolism, adiposity, insulin resistance, inflammation of obesity.

Assessment

Grade Item	Weight	Notes	Relevant dates
Quizzes	20%	4 total (5% each)	Weeks 3,5,7,9
Class Participation/Clicker Questions	10%	Students will be graded based on the involvement of the student during case study and usual class discussion through clicker questions.	
Individual Assignments	20%	Problems, written assignments, explainers, etc.	
Group Case Studies	20%		
Final Exam	30%	Cumulative	Exam Week

Assessment Schedule

Note that 25% of course assessments are scheduled to be completed and returned before the final course drop date in week 8.

Possible Instructors

Dr. Robert Brown Dr. Sukhinder Cheema Dr. Amy Todd Dr. Scott Harding Dr. Robert Bertolo Dr. Janet Brunton

HUBI 4800 Human Biosciences Capstone

ABBREVIATED COURSE TITLE

Human Biosciences Capstone

RATIONALE

The Department of Biochemistry underwent the Academic Unit Planning review process in early 2020, and over an 18-month period, engaged in a CITL-supported, comprehensive review with a focus on identifying and mapping core concepts and Program Level Outcomes. As a result, a new program with new courses has been developed to address identified gaps and redundancies, and to better match the changing face of the departmental expertise. This proposed course significantly builds on foundational biochemical, nutrition, and molecular knowledge with a focus on the application of these concepts to human health and disease. It has been designed to be interdisciplinary and will be co-taught by faculty from different disciplinary backgrounds, to ensure that content is presented through an interdisciplinary lens. This course will provide the opportunity for students to apply skills learned throughout their program, ensure that students are better prepared for their future careers, and will help to meet the demand for undergraduate programming focussed on the molecular basis of human health and disease.

CALENDAR CHANGES

HUBI 4800 Human Biosciences Capstone is a seminar course in which faculty instructors and students will meet to discuss concepts and methods related to the study of human health. Students will have the opportunity to read and critique current literature, discuss the literature with peers, and work with a faculty mentor to design a research protocol relevant to human biosciences.

PR: Restricted to Human Biosciences major and honours students with at least 60 credit hours in courses.

CALENDAR ENTRY AFTER CHANGES

HUBI 4800 Human Biosciences Capstone is a seminar course in which faculty instructors and students will meet to discuss concepts and methods related to the study of human health. Students will have the opportunity to read and critique current literature, discuss the literature with peers, and work with a faculty mentor to design a research protocol relevant human biosciences.

PR: Restricted to Human Biosciences major and honours students with at least 60 credits hours in courses.

SECONDARY CALENDAR CHANGES

[Please refer to the associated new program proposal and changes]

SIMPLE COURSE OUTLINE

(For an example of a full syllabus, please refer to the sample syllabi provided for the proposed HUBI 2003 Basics of Human Metabolism)

Textbook

There is no specific textbook for this course. The course will make use of primary literature which will be provided via library links through the course Brightspace shell. Reading material will predominantly be different types of scientific papers, but may include websites and videos related to research techniques.

Week	Topics	Notes
1	Skills/Research Techniques 1*	Timed Quiz (2.5%)
2	Skills/Research Techniques 2	Timed Quiz (2.5%)
3	Skills/Research Techniques 3	Timed Quiz (2.5%)
4	Skills/Research Techniques 4	Timed Quiz (2.5%)
5	Protocol Development Stage 1	10%
6	Protocol Development Stage 2	10%
7	Midterm Break	
8	Protocol Development Stage 3	
9	Protocol Development Stage 3	15%
10	Debates	20%
11	Protocol Development Stage 4	
12	Protocol Development Stage 4	20%
13	Additional week for contingencies	

Course Schedule and Topics

* Note: The specific content of each Research Techniques week (week 1 to 4) will be determined by the faculty members involved in the course each semester; this will exploit the current expertise within the department.

Assessment

Grade Item	Weight	Notes	
Timed Quizzes	10%	4 total (2.5% each)	
Debate	20%	Small group, in-class debate on current "hot topics" in human biosciences. Submission of 1 pg summary.	
Critical 159 Appraisal of Research		Individual writing assignment, summarizing and critically appraising three scientific papers. Coordinated with the theme chosen for the research protocol assignment (see below).	
Research Protocol Development	55%	 Groupwork components: Research topic and Introduction (10%) Research Question & Hypothesis (10%) Individual components: Critical appraisal of research First protocol draft (15%) including study design and methods, 10 pages total Final protocol draft (20%) 	
Bonus Assessment		Students encouraged to attend >2 departmental seminars and provide a written assessment. Students can only submit 2 bonus assignments. Total bonus marks available is 5% ($2.5 \times 2 = 5\%$ each). Total course grade cannot exceed 100%.	

Assessment Schedule

Note that 25% of course assessments are scheduled to be completed and returned before the final course drop date

Possible Instructors – all Human Biosciences faculty members are qualified to teach the capstone course

Memorial University of Newfoundland Undergraduate Calendar Change Proposal Form Appendix Pages

Academic Unit	Response Received and Date		
Chemistry	Yes/No;	Date:	
Computer Science	Yes/No;	Date:	
Mathematics and Statistics	Yes/No;	Date:	
Ocean Sciences	Yes/No	Date: 24/NOV/22	
Psychology	Yes	Date: 08/NOV/22	
Biology	Yes	Date: 02/NOV/22	
	& 17/NOV/22		
Physics	Yes	Date: 16/NOV/22	
Humanities and Social Sciences	Yes/No;	Date:	
Geography	Yes/No;	Date:	
Human Kinetics and Recreation	Yes	Date: 09/NOV/22	
Pharmacy	Yes	Date: 08/NOV/22	
Nursing	Yes/No;	Date:	
Arts and Social Sciences (Grenfell)	Yes/No;	Date:	
Science and the Environment	Yes	Date: 06/NOV/22	
(Grenfell)			
Fine Arts (Grenfell)	Yes/No;	Date:	
Marine Institute	Yes/No;	Date:	
Medicine	Yes	Date: 07/NOV/22	
Engineering	Yes	Date: 14/NOV/22	
Education	Yes/No;	Date:	
Music	Yes	Date: 04/NOV/22	

CONSULTATIONS SOUGHT

LIBRARY REPORT

Erin Alcock (Science Research Liaison Librarian) reviewed the new program proposal and provided a memo that indicated, "I have reviewed the proposal for the Human Biosciences program and find that Memorial Libraries is very able to support this change. In much the same way that the department anticipates this to be "resource-neutral," the courses and research for the Human Biosciences program can be covered under existing Library budget allocations."

The memo is attached as Appendix 1

RESOURCE IMPLICATIONS

Offering the new Human Biosciences program in place of the current Biochemistry and Biochemistry (Nutrition) programs will be cost neutral at maximum, and will likely lead to more efficient use of instructor time. The proposed new courses will replace courses in the

existing Biochemistry department programs. A maximum of approximately 500 additional TA hours, phased in over 3 years, will be required due to the increased laboratory content of the programming. Increased lab offerings can be accommodated with current lab staffing levels.

ADDITIONAL INFORMATION RELATED TO THE NEW HUMAN BIOSCIENCES PROGRAM AND THE NEW COURSE PROPOSALS

- 1. Library Report
- 2. <u>Program Development, Foundational Concepts and Program Learning</u> <u>Outcomes</u>
- 3. <u>Complete Sample Course Outline For Human Biosciences 2003 Basic Human</u> <u>Metabolism</u>
- 4. Secondary Calendar Changes
- 5. Consultation Feedback
- 6. Course Schedule Advice Sheet
- 7. Undergraduate Society Administered Questionnaire/Feedback


APPENDIX 1

Collection Development Division Queen Elizabeth II Library

24 November 2022

To: Janet Brunton, Department of Biochemistry

From: Erin Alcock, Science Research Liaison Librarian

Subject: New Program Proposal: Human Biosciences

I have reviewed the proposal for the Human Biosciences program and find that Memorial Libraries is very able to support this change. In much the same way that the department anticipates this to be "resource-neutral," the courses and research for the Human Biosciences program can be covered under existing Library budget allocations.

Appendix 2

Development of the Human Biosciences Program

The Human Biosciences program has arisen from a comprehensive review of the Department of Biochemistry's undergraduate curriculum. Working with program development specialists from the Centre for Innovation in Teaching and Learning (CITL), faculty and staff engaged in multiple retreats and consultations over an 18-month period. The primary focus was to identify Program Level Learning Outcomes, the Foundational Pillars of the program, and the core concepts within those pillars.

Through the program development process, 12 Foundational Pillars were identified. During this process, we also identified the need for a single interdisciplinary program in "Human Biosciences" to better reflect program goals and departmental expertise. Following the development of the <u>12 Foundational Pillars</u>, expert working groups consisting of three to five faculty and staff members were formed to unpack core concepts within each of the pillars, and then to map out these concepts within the core program (focused on building concepts from year one through year three). This allowed us to maintain alignment with our overreaching program goals while developing a comprehensive, truly interdisciplinary core program for the degree that removes redundancy and provides the necessary scaffolding for student progression.

During the program development process, faculty and staff members also established nine <u>Program Level Learning Outcomes</u> (PLOs). In contrast to the core concepts, these nine PLOs focused on the broader, transferrable skills, knowledge and values that our graduates will develop.

Twelve Foundational Pillars

- 1. Lipids Structure and Function
- 2. Carbohydrate Structure and Function
- 3. Protein and Amino Acid Structure and Function
- 4. Signal Transduction
- 5. Quantitative Methods
- 6. Nucleic Acids
- 7. Cell-Cell Interactions
- 8. Human Physiology and Cellular Biology
- 9. Biological Thermodynamics
- 10. Cell to Whole Body Experiential Laboratory
- 11. Metabolism
- 12. Human-Environment Interaction

Program Level Learning Outcomes

1. Effect Independent and Collaborative Work

Work effectively individually and collaborate in team situations to apply biomolecular sciences concepts and the scientific method to promote evidencebased decision making in problem solving situations.

2. Ethical Behaviour, EDI and Advocating for Evidence-Based Science

Disseminate and engage in activities that promote EDI, exhibit ethical behaviour (e.g., honesty and integrity) in their professional and everyday lives, and respect and understand indigenous ways of knowing at a global level while advocating for scientific evidence-based decision making.

3. Mastery of Communication Skills

Demonstrate mastery of foundational concepts by explaining orally, in writing, and visually, to scientific peers and the general public, the molecular concepts underlying human health and disease.

4. Data Interpretation

Be able to analyze and interpret molecular biosciences datasets, develop hypotheses based on these analyses and interpretations, and identify suitable quantitative and/or qualitative techniques to test hypotheses.

5. Lab Safety and Lab Skills

Work safely in biosciences laboratory environments while adhering to municipal, provincial and federal regulations, operate standard laboratory equipment, and follow scientific protocols to carry out biosciences-related research independently.

6. Evaluating and Translating Science

Be able to critically evaluate the research literature and engage in evidencebased discussions in biomolecular sciences-related areas, and translate research innovation for the benefit of society at large.

7. Applying Knowledge to Human Health

Apply knowledge of biomolecular sciences to wider societal concepts of human health and disease at local, national and global levels.

8. Understanding Cell and Organ Function

Apply knowledge of biochemical and nutritional principles to explain the functions and roles of organs, cells, and their associated biomolecules in health and disease.

9. Leadership in the Translation of Bioscience

Prepare to take leadership roles in communicating to and educating societal stakeholders on the ethical and equitable translation of biomolecular sciences to everyday life.

To ensure that our new program will facilitate the development of these essential skills, knowledge and values, these nine outcomes will be mapped against the core courses. With the rollout of 2000-level courses in the 2023-24 academic year, the PLOs will be used in consultation with assigned instructors, to reflect on and guide the instructional approaches, activities, assessments, and supplemental learning within the courses. While the 2000-level courses will focus on PLO development at an introductory level, this base will then be used to map out the development of the PLOs within the 3000-and 4000-level courses. Mapping in this way ensures that PLOs are incorporated progressing from *introduction*, to *reinforcement*, to *mastery* of the skills, knowledge and values that are essential for graduates of a modern Human Biosciences BSc program.



APPENDIX 3

Human Biosciences 2003: Basics of Human Metabolism Fall/Winter/Spring 20XX

Department of Biochemistry

Instructor:	Name (pronouns) Office # <u>email@mun.ca</u>	Time Slot:	[days of the week] XX:00am – XX:50 am NST/NDT [room location] Note any online requirements, weather
Possible Instructors:	Dr. Sukhinder Cheema Dr. Robert Brown Dr. Amy Todd		closure procedures, etc.

Office hours are [days of week] XX:00-XX:00 am/pm (NST/NDT). Students wishing to discuss material virtually, or outside of office hours, may request an appointment. Every effort will be made to respond to emails within 24 hours, with the exception of evenings, weekends and holidays.

Course Description:

HUBI 2003 examines how we digest, absorb, and metabolize carbohydrates, fats, proteins, and micronutrients. Students will learn the processes involved in human metabolism including glycolysis, the citric acid cycle, amino acid metabolism, the pentose phosphate pathway, fatty acid metabolism, oxidative phosphorylation and ATP synthesis, and triacylglycerol synthesis and storage. These topics will be presented in the context of linking metabolism and health.

PR: BIOL 1001

CR: the former BIOC 3206, BIOC 3106, or BIOC 3102; PHAR 3111 Credit restriction: the former BIOC 3206, BIOC 3106, BIOC 3102 or Pharmacy 3111 **Course Learning Goals:**

- Explain the role of catabolic and anabolic pathways in cellular metabolism
- Describe the processes involved in the metabolism of carbohydrates, lipids, amino acids, and micronutrients
- Summarize how electron carriers are used to transport electrons to the Electron Transport Chain
- Explain how the reactions of cellular respiration are able to result in the release of chemical energy
- Critically examine case studies related to metabolic processes, health and disease
- Summarize and communicate information relating to metabolism and human health to a general audience

Required Text and Resources

Nelson, D.L, Cox, M.M. & Hoskins, A.A. (2021). *Lehninger Principles of Biochemistry* (8th ed.). W. H. Freeman and Company.

Recommended: Gropper, S.S., Smith, J.L., & Carr, T.P. (2021). Advanced Nutrition and Human *Metabolism* (8th ed.). Cengage Learning.

You may already have these texts, or have full access to the online textbooks, as they are required books for other core courses in the Human Biosciences program. Please check on this prior to purchasing.

This course uses Brightspace for the posting of news, course content, assignments, discussions, and for mark distribution. This can be accessed via <u>online.mun.ca</u> using your MUN login credentials.

Grade Item	Weight	Difficulty Level (1-5 stars)	Notes	Relevant due dates
Problem sets	30%	**	5 total, lowest mark dropped, 4x7.5% Based on lecture content	Due at end of weeks 1, 3, 5, 10 and 12
Current topics in metabolism - Written assignment - Public communication	15% 15%	*** **	Student-directed topic choice. Both assignments target a general audience. Two-page written article. Communication may be a video, webpage, self-paced online activity, etc.	Written paper due at end of week 8 Communication due last week of term
Midterm	20%	****		During Week 6
Final Exam	20%	****	non-cumulative	TBD (During Exam Week)

Method of Evaluation

Note that 35% of course assessments are scheduled to be completed and returned before the final course drop date.

Missed assessments

Exemptions due to illness must be in keeping with University Regulations and current university Covid-19 policies. Exemptions due to circumstances not covered in the University Regulations or policies will be addressed on a case-by-case basis. Approved exemption from an assessment will allow for:

- **Problem sets:** There are no alternate/make-up problem sets. Approved exemptions for two or more problem sets will result in those marks being reallocated to the midterm (for sets 1-3) or the final exam (for sets 4-5).
- Current topics assignments: Late submissions for either the written assignment or the public

communication will lose 10% per day late. Approved exemptions will be provided an extended deadline on a case-by-case basis.

- **Midterm:** There is no alternate/make-up midterm. Approved exemption from the midterm will allow for the 20% value to be reallocated to the final (resulting in a 40% final exam) which will become cumulative.
- **Final exam:** Exemptions of any kind must be in keeping with University Regulations regarding final exams. There are no supplementary final exams offered for this course.

Additional Policies / Supports

Commitment to Accommodation

Memorial University of Newfoundland is committed to fostering equitable and accessible learning environments for all students. Accommodations for students with disabilities are provided in accordance with the <u>Accommodations for Students with Disabilities Policy</u> and its related procedures. Students who feel that they may require formal academic accommodations to address barriers or challenges they are experiencing related to their learning are encouraged to contact <u>Accessibility Services (the Blundon Centre)</u> at the earliest opportunity to ensure any required accommodations are provided in a timely manner. You can contact Accessibility Services (the Blundon Centre) by emailing <u>blundon@mun.ca</u>.

Safe, Equitable and Inclusive Learning

In line with the Newfoundland and Labrador Human Rights Act, this course aims to provide a safe, equitable and inclusive learning environment regardless of race, colour, nationality, ethnic origin, social origin, religious creed, religion, age, disability, disfigurement, sex (including pregnancy), sexual orientation, gender identity, gender expression, marital status, family status, source of income or political opinion. **If any student feels this has not been achieved, and that they, or others, are/could be negatively impacted, please contact me**. All conversations are confidential.

Academic Integrity

Academic integrity means taking full responsibility for the academic work you submit for your courses so that your instructors can evaluate you on the basis of your own understanding and effort. It means being honest and honourable in all academic pursuits, even in difficult circumstances. Students are expected to know and avoid academic offences; ignorance of an offence is not an acceptable excuse for committing it. Penalties could include reprimand, reduction of grade, probation, suspension, or expulsion from the University. For more information, you may refer to the University Regulations for Academic Misconduct (Section 6.12) in the University Calendar, revisit the INTG 1000 course in Brightspace, and/or see the <u>undergraduate page about academic integrity</u>.

Recordings

With the exception of provisions made for students with special needs, all other recording of visual and/or audio content in sessions is restricted and must be approved by the instructor.

Your Health

There is nothing more important than your mental and physical health. Doctors' notes are **not** required for medical absences in this course. You are encouraged to seek appropriate medical attention from the Student Wellness and Counselling Centre. I am committed to working with students with pre-existing medical and mental health needs, as well as new needs that may arise within the semester. I encourage you to reach out to the Blundon Centre as early as possible to discuss any adjustments you think may be necessary in this course. Let's explore the options to help you succeed, no matter what is going on.

Additional Supports

Memorial University offers a broad range of supports, both academic and general in nature. These include, but are not limited to: Student Wellness and Counselling Centre, Student Support and Crisis Management, Student Parent Assistance & Resource Centre, The Circle: First Nations, Inuit & Métis Students Resource Centre, and the International Students Resource Centre. Full listings and links to these and other supports can be found at <u>www.mun.ca/student/</u> and <u>https://www.munsu35.ca/resource-centres/</u>.

You may also wish to reach out to the many <u>Student Clubs and Societies</u> which can help you deepen learning in your discipline or pursue your interests outside the classroom and get connected with others.

Navigate App for Student Success

Students are encouraged to download the Navigate app from Apple or Google Play by searching "Navigate Student". The app provides information around dates and deadlines, allows students to book appointments with various advisors and support services, and can help establish study groups within courses using the Study Buddies feature. Please note that if you cannot access the app, a desktop version is available at <u>https://mun.guide.eab.com/app</u>.

Tentative Course Schedule

Note that as an in-person course, sessions and course content **will NOT continue** during oncampus building closures due to weather. Changes or cancellations due to exceptional circumstances will be communicated through Brightspace (D2L).

Week	Topics	Notes	Evaluations
1	Digestion and absorption of macronutrients	Including protein, carbohydrate, and lipid breakdown through GI tract	Problem Set 1
2	Digestion and absorption of micronutrients	Including vitamin and mineral absorption and metabolism	
3	Integration of metabolism & placement of carbohydrates, proteins/amino acids, and lipids	Gluconeogenesis and lipolysis are briefly touched upon	
4	NADH, NADPH, and FADH2 in biological redox reactions	Beginner level	Problem Set 2
5	Glycolysis	Includes a brief introduction to gluconeogenesis and global regulation tied to energy production. Omits enzyme regulation.	
6	Citric Acid Cycle / Krebs Cycle	Includes only basic introduction to enzyme regulation	Problem Set 3
7	Oxidative phosphorylation & ATP synthesis	Covering only a basic overview of steps within complexes and enzyme regulation	Midterm
8		Midterm Break	
9	Amino acids: urea cycle	Includes only a basic coverage of enzyme regulation	Written Assignment Due
10	Pentose phosphate pathway	Includes only a basic introduction to NADPH synthesis	Problem Set 4
11	Fatty acid synthesis (palmitate)	Includes only a basic introduction to regulation	
12	Triacylglycerol synthesis	Includes only a basic overview of each step and no coverage of regulation	Problem Set 5
13	Case studies tied to above topics		Communication Due

All lecture material, including notes and presentations, are the intellectual property of the course instructor and may not be reproduced without permission.

Appendix 4

Secondary Calendar Changes

Table of Contents with Links

- 1. Bachelor of Science in Nutrition (Dietetics Option)
- 2. Joint Major in Marine Biology
- 3. Joint Honours (Non-Biochemistry)
- 4. Biology Programs
- 5. <u>Chemistry Programs</u>
- 6. Ocean Sciences Programs
- 7. Physics and Physical Oceanography Programs
- 8. Psychology Programs
- 9. Biology Courses
- 10. <u>Chemistry Courses</u>
- 11. Earth Sciences Courses
- 12. Ocean Sciences Courses
- 13. School of Human Kinetics and Recreation
- 14. Faculty of Medicine Courses
- 15. Faculty of Nursing Courses
- 16. School of Pharmacy Courses

P a p e r 5

4.1 Programs in the Faculty of Science

- 1. The Faculty of Science offers a variety of programs which lead to a General Degree of Bachelor of Science or an Honours Degree of Bachelor of Science. These programs consist of a minimum of 120 credit hours in courses which include the following:
 - a. the Core Requirements, as described under <u>Core Requirements and Academic</u> <u>Advising</u>, (
 - b. a Program of Study, as described under <u>Programs of Study for the General Degree of Bachelor of Science</u> and <u>Programs of Study for the Honours Degree of Bachelor of Science</u>, as part of which one or more Major programs shall be completed, and
 c. a number of additional courses, as described under <u>Electives g</u>
- 2. In conjunction with the Faculty of Humanities and Social Sciences, the Faculty of Science offers the **Joint Degrees of Bachelor of Science and Bachelor of Arts**, which simultaneously leads to
- both a General Degree of Bachelor of Science and a General Degree of Bachelor of Arts.
 The Faculty of Science also offers a number of Minor programs, as destribed under Minor
 Programs in the Faculty of Science. These are available to students completing a General
- Degree of Bachelor of Science or an Honours Degree of Bachelor of Science, but may also be undertaken by students in other degree programs should the regulations of those programs permit it.
- 4. A Major or a Minor consists, in part, of an approved concentration of courses in a single subject area, known respectively as the Major subject or Minor subject. These Subject areas may include: Biochemistry, Biology, Chemistry, Computer Science, Earth Sciences, ≇conomics, Geography, Human Biosciences, Mathematics and Statistics, Ocean Sciences, Physics, or Psychology.
- 5. For the purposes of a General Degree of Bachelor of Science or an Honours Degree of Bachelor of Science, a student may complete at most one Major program from each department which offers more than one, and may not complete a Minor program from the department of any of the student's Major programs.
- 6. When a Major program may be completed both as part of the Degree of Bachelor of Science and the Degree of Bachelor of Arts, students are free to choose the degree program they wish to follow and may change from one to the other; however, they may not obtain both degrees in the same Major program at this University.

5.3.1 Memorial University of Newfoundland Courses

Under the terms of the MOU, the following 17 courses, 51 credit hours at Memorial University of Newfoundland must be completed with a minimum 60% overall average before being admitted to the third year of Acadia University's program:

- 1. Biology 1001
- 2. Chemistry 1050 and 1051 (or Chemistry 1200, 1001)
- 3. Chemistry 2400
- 4. English 1090 or the former English 1080, 1110 (or equivalent)
- 5. Mathematics 1090 and 1000 (or Mathematics 1000 and one elective)
- 6. Pharmacy 2002, 2003, and one of Pharmacy 2004, <u>Human Biosciences 2001 or the former</u> Biochemistry 2101 or the former 2201, (only students who are selected for this program will be permitted to register for these Pharmacy courses)
- 7. Psychology 1000, 1001
- 8. Statistics 2500, 2501
- 9. Two Humanities and Social Sciences electives

5.3.4 Programs Tables

The following tables present a schedule for completing the course requirements at Memorial University of Newfoundland.

Term		Suggested Courses
•	Fall • Semester 1	 Biology 1001 Chemistry 1010 or 1200 English 1090 or the former English 1080 Mathematics 1090 Psychology 1000
•	Winter • Semester 2	 the former Chemistry 1011 or 1001 English 1110 (or equivalent) Mathematics 1000 NUTR 2323 through Acadia Online at <u>www.openacadia.ca</u> Psychology 1001
•	Fall • Semester 3	 Humanities and Social Sciences Elective Chemistry 2440 NUTR 1313 through Acadia Online at <u>www.openacadia.ca</u> Pharmacy 2002 Statistics 2500
•	Winter • Semester 4	 Humanities and Social Sciences Elective NUTR 1323 through Acadia Online at <u>www.openacadia.ca</u> Pharmacy 2004 (<u>Human Biosciences 2001 or the former</u> Biochemistry 2101 or the former 2201) Pharmacy 2003 Statistics 2501

For Students Who Successfully Complete Mathematics 1090 in Their First Semester

For Students Who Successfully Complete Mathematics 1000 in Their First Semester

Term		Suggested Courses
•	Fall • Semester 1	 Biology 1001 Chemistry 1010 English 1090 or the former English 1080 Mathematics 1000 Psychology 1000
•	Winter • Semester 2	 the former Chemistry 1011 English 1110 (or equivalent) NUTR 2323 through Acadia Online at <u>www.openacadia.ca</u> Psychology 1001 Statistics 2500
•	Fall • Semester 3	 Humanities and Social Sciences Elective Chemistry 2440 NUTR 1313 through Acadia Online at <u>www.openacadia.ca</u> Pharmacy 2002 Statistics 2501
•	Winter • Semester 4	 Humanities and Social Sciences Elective Elective NUTR 1323 through Acadia Online at www.openacadia.ca Pharmacy 2004 (<u>Human Biosciences 2001 or the former</u> Biochemistry 2101 or the former 2201) Pharmacy 2003

Notes:

1. Statistics 2501 is offered on campus in the Fall semester and normally is offered only by distance education in

the Winter semester.

2. While students are strongly encouraged to complete Nutrition 2323 in the first year, they can substitute an

Humanities and Social Sciences elective for Nutrition 2323 in the first year but must then successfully complete

Nutrition 2323 in the second year.

3. All three Open Acadia courses must be successfully completed prior to starting courses at Acadia.

8 Supplementary Examinations

- Supplementary examinations will be allowed in certain courses offered by the Department of Biochemistry and the Department of Mathematics and Statistics which have written final examinations. In each course, students will be informed as to the possibility of a supplementary examination during the first week of classes. This information will be provided in writing, as part of the Course Syllabus.
- 2. Supplementary examinations will be of similar length and degree of difficulty as the original final examination.
- 3. Students who wish to write a supplementary examination must apply in writing to the appropriate department within one week of the official release of grades by the University.
- 4. Students who have clear or conditional standing may write a supplementary examination in a course if they obtained a final grade of 45-49F and if their grade in the course excluding the original final examination is at least 50%.
- 5. In order to pass the course, a student who has been approved to write a supplementary examination must pass the supplementary examination. If the student passes the supplementary examination, then a new final grade will be calculated using the same evaluation scheme as used in the course, but with the result of the supplementary examination replacing that of the original final examination. Any additional course requirements, including a requirement to pass the laboratory component of a course, will continue to apply.
- 6. If the new final grade is higher than the original, it will replace the original grade on the student's transcript, subject to the condition that the new final grade will not exceed the grade which the student had obtained in the course excluding the original final examination. The student's transcript will indicate that the course result was earned as the result of a supplementary examination.
- 7. Supplementary examinations will be written no later than the first week of the semester immediately following the one in which the course was failed, and will normally coincide with the writing of deferred examinations. Grades for supplementary examinations will be submitted to the Office of the Registrar within one week following the commencement of classes for that semester.
- 8. A student may write only one supplementary examination for any one registration in a course; if a failing grade is obtained in the course following the supplementary examination then the course must be repeated in order to obtain credit.

10.1.13.2 Program of Study

Students pursuing a Joint Major in Marine Biology are required to complete a minimum of 60 combined credit hours from Biology and Ocean Sciences, with a minimum of 27 credit hours in each subject:

- Six credit hours in <u>Critical Reading and Writing (CRW)</u> courses, including at least 3 credit hours in English courses;
- 2. Mathematics 1000;
- 3. Earth Sciences 1000;
- 4. Statistics 2550 or any of the courses listed in the credit restrictions of Statistics 2550;
- 5. Physics 1020 and 1021 (or 1050 and 1051);
- 6. Chemistry 1050 and 1051 (or 1200 and 1001), and 2400 and 2401;
- 7. <u>Human Biosciences 2001 or the former Biochemistry 2101 or the former 2201;</u>
- 8. Biology 1001, 1002, 2060, 2122, 2250 (or <u>Human Biosciences 2004 or the former</u> Biochemistry <u>2200</u> or 2100), 2600, 2900, 3710 (or Ocean Sciences 2000) and 3711;
- Ocean Sciences 1000, 2000 (or Biology 3710), 2001, 2100, and at least one of 2500 or 4500 (or Biology 4710);
- 10. additional courses to complete the required 60 combined credit hours in Biology and Ocean Sciences with a minimum of 27 credit hours in each subject (except Biology 2040, 2041, 2120, 3053,

and 3820). A minimum of 6 credit hours in Biology at the 3000/4000 level and 12 credit hours in Ocean Sciences at the 3000/4000 level is required; and

11. other courses as necessary to complete the minimum of 120 credit hours required for the General Degree of Bachelor of Science.

Notes:

- 1. Courses cross listed between Biology and Ocean Sciences can only count for one subject or the other.
- 2. A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.
- 3. Students are encouraged to take <u>Human Biosciences 2003</u>, or the former Biochemistry 3206 or 3106, as it

is a pre-requisite for several higher-level courses in Biology and in Ocean Sciences.

10.2 Joint Honours 10.2.1 Applied Mathematics and Chemistry Joint Honours

The following courses are required:

- 1. Six credit hours in **Critical Reading and Writing (CRW)** courses, including at least 3 credit hours in English courses.
- 2. A computing course. Computer Science 1510 is recommended.
- 3. <u>Human Biosciences 2001 or the former Biochemistry 2101 or the former 2201, or Human</u> <u>Biosciences 2901.</u>
- 4. Physics 1050 (or 1020) and 1051 (or 1021).
- 5. Mathematics 1000, 1001, 2000, 2050, 2051, 2260, 2320, 3000, 3001, 3132, 3161, 3202, 3210, 41 60.
- Chemistry 1050 and 1051 (or 1200 and 1001), 2100, 2210, 2301, 2302, 2400, 2401, 3110, 3210 o r 3211, 3303.
- 7. Six additional credit hours chosen from courses numbered 3000 or higher that are offered by the Department of Chemistry.
- 8. An Honours Dissertation (Mathematics 419A/B or Chemistry 490A/B). The topic of the Honours Dissertation must have the prior approval of the Heads of the two Departments. A faculty member of either Department may act as supervisor.
- 9. A sufficient number of elective courses to bring the degree up to a total of 120 credit hours.
- 10. Mathematics 2130 is recommended.

10.2.8 Biology and Earth Sciences Joint Honours

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

- 1. Six credit hours in **Critical Reading and Writing (CRW)** courses, including at least 3 credit hours in English courses.
- Mathematics 1000 and 1001, Biology 1001 and 1002, Earth Sciences 1000 and 1002, Chemistry 1050 and 1051 (or 1200 and 1001), Physics 1020 and 1021 (or 1050 and 1051).
- 3. Chemistry 2440, <u>Human Biosciences 2001 or the former Biochemistry 2101 or the former 2201,</u> <u>Human Biosciences 2003 or the former Biochemistry 3106 or 3206, one of Statistics 2550 or 2560.</u>
- 4. Biology 2060, 2250, 2600, 2900, one of 3401, 3402, 4245 or 4404; plus Biology 3710, 3711, and 4505. In addition, further Biology courses at the 2000, 3000, or 4000 level must be selected by the student in consultation with the supervisor to make up a minimum of 42 credit hours in Biology not including Biology 499A or 499B.
- 5. Earth Sciences 2030, 2031, 2502, 2905; plus a minimum of 24 credit hours in other Earth Science courses from 2000 to 4000 level, at least 3 credit hours of which must be at 4000 level. Earth Sciences 2150, 2914, 2915, 2916, 2917, 2918, 4310, and 4950 cannot be used to fulfill this requirement. Career-related streams outlined in the departmental Student Handbook should be used as a guide to course selection so as to achieve a concentration in one facet of Earth Sciences.
- 6. An Honours dissertation (Biology 499A/B or Earth Sciences 499A/B). The topic of the Honours dissertation must be chosen with the approval of both Department Heads. A faculty member of either Department may act as supervisor.

7. Other courses to complete a minimum of 135 credit hours in courses for the Honours degree, with at least 84 credit hours in courses in Biology and Earth Sciences combined.

Any change in the program of study must have the prior approval of the Heads of the two Departments concerned.

10.2.9 Biology and Psychology Joint Honours

Note:

Students completing this program cannot receive credit for Psychology 2920. The following courses (or equivalent) are required:

- 1. Biology 1001, 1002, 2060, 2250, 2600, 2900; one of 3401, 3402, 4245, 4404; four Biology electives at the 2000, 3000 or 4000 level not including Biology 499A or 499B.
- Psychology 1000, 1001, 2520 (or 2521), 2910, 2911, 2930, one of the former PSYC 3250, 3800, 3810, 3830, 3840, or 3860; 3900, 4910; one of the following: 3050, 3100, 3251, 3350, 3450, 3620, 3650; one further 4000 level Psychology research experience course.
- 3. Biology or Psychology 3750, 4701, 499A/B.
- 4. Six credit hours in **Critical Reading and Writing (CRW)** courses, including at least 3 credit hours in English courses.
- Mathematics 1000; Chemistry 1050 (or 1200), 1051 (or 1001), 2400, and 2401; Physics 1020 (or 1050) and 1021 (or 1051); <u>Human Biosciences 2001 or the former</u> Biochemistry 2101 or the former 2201, and <u>Human Biosciences 2003 or the former Biochemistry</u> 3106 or 3206.
- 6. Other courses, if necessary, to complete at least 120 credit hours of courses.

10.2.10 Biology and Psychology (Behavioural Neuroscience) Joint Honours

Note:

Students completing this program cannot receive credit for Psychology 2920. The following courses (or equivalent) are required:

- 1. Biology 1001, 1002, 2060, 2250, 2600, 2900; one of 3401, 3402, 4245, 4404; five Biology electives at the 2000, 3000 or 4000 level not including Biology 499A or 499B.
- Psychology 1000, 1001, 2521, 2910, 2911, 2930; one of the former PSYC 3250, 3810, 3830, 3840, or 3860; 3800, 3820, 3900; one further course in Psychology chosen from the following: 3050, 3100, 3251, 3350, 3450, 3620, 3650, 3750; any research experience course and one of Psychology 4850, 4851, 4852, 4853, or 4854; or, any selected topics course and Psychology 4870.
- 3. Biology or Psychology 499A/B.
- 4. <u>Human Biosciences 2001 or the former Biochemistry 2101 or the former 2201, Human Biosciences</u> 2003 or the former Biochemistry 3106 or 3206.
- 5. Six credit hours in **Critical Reading and Writing (CRW)** courses, including at least 3 credit hours in English courses.
- Mathematics 1000 and 1001; Physics 1020 (or 1050) and 1021 (or 1051); Chemistry 1050 (or 1200), 1051 (or 1001), 2400, and 2401.
- 7. Other courses, if necessary, to complete at least 120 credit hours of courses.

Note:

As provided for under the **Graduation Requirements** for the Honours Degree of Bachelor of Science, Honours

students must obtain a grade of "B" or better, OR average of 75% or higher in all the required courses listed in

Clauses 1, 2, 3, and 4 above, except those at the 1000 level.

10.2.11 Biology and Statistics Joint Honours

As a component of the **Degree Regulations** for the Honours Degree of Bachelor of Science, the following courses are required:

1. Six credit hours in **Critical Reading and Writing (CRW)** courses, including at least 3 credit hours in English courses.

- Mathematics 1000 and 1001, Biology 1001 and 1002, Chemistry 1050 and 1051 (or 1200 and 1001, or 1010 and the former 1011), Physics 1020 and 1021, or equivalent;
- 3. Mathematics 2000, 2050, 2051, Statistics 2500, 2501 or 2560, 3520, 3521, 4530, and 4581;
- 4. 9 further credit hours in Statistics courses including at least 6 credit hours in courses at the 4000 level or higher but not including Statistics 459A/B;
- 5. Chemistry 2400 and 2401, <u>Human Biosciences 2001 or the former Biochemistry 2101 or the former</u> 2201, and <u>Human Biosciences 2003 or the former Biochemistry 3106 or 3206;</u>
- Biology 2060, 2250, 2600, 2900, one of 3401, 3402, 4245, or 4404. In addition, further Biology courses at the 2000, 3000 or 4000 level must be selected by the student in consultation with the supervisor to make up a minimum of 42 credit hours in Biology but not including Biology 499A or 499B;
- 7. Either Biology 499A/B or Statistics 459A/B; and
- 8. A computing course. Computer Science 1510 is recommended.

10.2.12 Chemistry and Earth Sciences Joint Honours

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

- 1. Six credit hours in **Critical Reading and Writing (CRW)** courses, including at least 3 credit hours in English courses.
- Mathematics 1000 and 1001, Earth Sciences 1000 and 1002, 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).
- 3. Earth Sciences 2030, 2031, 2401, 2502, 2702, 2905, 3420, 3600; plus 6 additional credit hours in 3000-level Earth Sciences courses, and 9 additional credit hours in 4000-level Earth Sciences courses.
- 4. Chemistry 2100, 2210, 2301, 2302, 2400, 2401 and 3110; and at least 6 additional credit hours in 3000-level and 6 credit hours in 4000-level Chemistry courses.
- 5. Mathematics 2000 and 2050.
- 6. Biology 2120 and <u>Human Biosciences 2001 or the former</u> Biochemistry 2101 or the former 2201.
- 7. An Honours Dissertation (Earth Sciences 499A/B or Chemistry 490A/B). The topic of the Honours Dissertation must have the prior approval of the Heads of the two Departments. A faculty member of either Department may act as supervisor.
- 8. Other courses to complete the prescribed minimum of 120 credit hours.

Any change in the program of study must have the prior approval of the Heads of the two Departments concerned.

10.2.13 Chemistry and Physics Joint Honours

The following courses are prescribed:

- 1. Six credit hours in **Critical Reading and Writing (CRW)** courses, including at least 3 credit hours in English courses.
- 2. Mathematics 1000, 1001, 2000, 2050, 3202, and 2260.
- Physics 1050 (or 1020) and 1051, 2055, 2750 or 2056, 2820, 3220, 3500, 3750, 3820, 3900, 4820, 3 additional credit hours in a Physics course numbered 3000 or higher and 6 additional credit hours in Physics courses numbered 4000 or higher.
- Chemistry 1050 and 1051 (or Chemistry 1200 and 1001), 2100, 2210, 2301, 2302, 2400, 2401, 3210 or 3211, 3303, and 6 additional credit hours in Chemistry courses numbered 3000 or higher.
- 5. <u>Human Biosciences 2001 or the former Biochemistry 2101 or the former 2201, or Human Biosciences 2901.</u>
- 6. An Honours Dissertation (Chemistry 490A/B or Physics 490A/B). The topic of the Honours Dissertation must have the prior approval of the Heads of the two Departments. A faculty member of either Department may act as supervisor.
- 7. A sufficient number of elective courses to bring the degree total to 120 credit hours.

10.2.21 Marine Biology Joint Honours

The program is jointly administered by the Department of Ocean Sciences and the Department of Biology. To be eligible for admission, students would normally follow the requirements for the Joint Major in Marine Biology. Specifically, students must have successfully completed Biology 2060, 2250, 2600, and 2900 and Ocean Sciences 2000 (or Biology 3710), 2001, 2100 and 2300 and obtained in these courses a grade of "B" or better, or an average of 75% or higher. Selection is based on academic performance in the required courses.

Students who wish to be admitted to this programs must submit an "Application for Admission to Honours Program Faculties of Humanities and Social Sciences or Science" to the Department of Biology and the Department of Ocean Sciences.

The following courses will be required:

- 1. Six credit hours in **Critical Reading and Writing (CRW)** courses, including at least 3 credit hours in English courses;
- 2. Mathematics 1000;
- 3. Earth Sciences 1000;
- 4. Statistics 2550 or any of the courses listed in the credit restrictions of Statistics 2550;
- 5. Physics 1020 and 1021 (or 1050 and 1051);
- 6. Chemistry 1050 and 1051 (or Chemistry 1200 and 1001), and Chemistry 2400 and 2401;
- 7. Human Biosciences 2001 or the former Biochemistry 2101 or the former 2201;
- Biology 1001, 1002, 2060, 2122, 2250 (or <u>Human Biosciences 2004 or the former</u> Biochemistry 2100 or 2200), 2600, 2900, 3710 (or Ocean Sciences 2000) and 3711;
- Ocean Sciences 1000, 2000 (or Biology 3710), 2001, 2100, 2300 and at least one of 2500 or 4500 (or Biology 4710);
- Additional courses to complete a required 69 combined credit hours in Biology and Ocean Sciences with a minimum of 30 credit hours in either subject (except Biology 2040, 2041, 2120, 3053, and 3820). A minimum of 9 credit hours in Biology at the 3000/4000 level and 15 credit hours in Ocean Sciences at the 3000/4000 level is required;
- 11. Either Biology 499A and 499B or Ocean Sciences 499A and 499B; and
- 12. A sufficient number of elective courses to bring the degree total to 120 credit hours.

Courses cross listed between Biology and Ocean Sciences can only count for one subject or the other. A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

11.2 Biology

www.mun.ca/biology

The following undergraduate programs are available in the Department:

- 1. Biochemistry-Cell Biology and Human Biosciences Joint Honours
- 2. <u>Biology and Earth Sciences (Geology) Joint Honours</u>
- 3. Biology and Psychology Joint Honours
- 4. Biology and Psychology (Behavioural Neuroscience) Joint Honours
- 5. <u>Biology and Statistics Joint Honours</u>
- 6. Biology Concentrations
- 7. Joint Major or Joint Honours in Marine Biology
- 8. <u>Major</u> or <u>Honours</u>, or <u>Major (Co-operative)</u> or <u>Honours (Co-operative)</u>, in Biology
- 9. Minor in Biology
- Details of joint programs are given in **Joint Program Regulations**.

Biology course descriptions are found at the end of the Faculty of Science section under **Course Descriptions, Biology**.

For the purposes of a Major, or Honours degree in Biology, Medicine 310A/B count as Biology courses.

11.2.3.1 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:

- Six credit hours in <u>Critical Reading and Writing (CRW)</u> courses, including at least 3 credit hours in English courses
- 2. Physics 1020 and 1021 (or equivalent)
- 3. Mathematics 1000

- 4. Chemistry 1050 and 1051 (or 1200 and 1001, or 1010 and the former 1011), Chemistry 2400 and 2401
- 5. Statistics 2550 or any of the courses listed in the credit restrictions of Statistics 2550
- 6. <u>Human Biosciences 2001 or the former Biochemistry 2101 or the former 2201, and Human</u> <u>Biosciences 2003 or the former Biochemistry 3106 or 3206</u>
- Extra Science courses as necessary to fulfil the requirement for 78 credit hours in Science as stipulated under <u>Electives</u> in the <u>Degree Regulations</u> 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).

11.2.4.1 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.

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:

- a. Biology 1001 and 1002 or their equivalents;
- b. 15 credit hours in the following core courses: Biology 2060, 2250, 2600, 2900, plus one of Biology 3401, 3402, 4245 or 4404; and
- c. 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.
- d. A maximum of 9 credit hours can be in Biology courses with no associated laboratory/seminar.

2. Core Course Requirements:

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

- a. Six credit hours in <u>Critical Reading and Writing (CRW)</u> courses, including at least 3 credit hours in English courses.
 - b. Physics 1020 and 1021 (or equivalent)
 - c. Mathematics 1000
 - d. Chemistry 1050 and 1051 (or 1200 and 1001, or 1010 and the former 1011), Chemistry 2400 and 2401
 - e. Statistics 2550 or any of the courses listed in the credit restrictions of Statistics 2550
 - f. <u>Human Biosciences 2001 or the former Biochemistry 2101 or the former 2201, and Human Biosciences 2003 or the former Biochemistry 3106 or 3206</u>
 - g. 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).

11.2.5.7 Molecular, Microbial, and Cell Biology

Students selecting a Molecular, Microbial and Cell Biology concentration are required to complete 18 credit hours from the following courses:

- 1. Biology 3050, 3052, 3401, 3402, 3530, 3950, 3951, 4050, 4241, 4250, 4251, 4404, 4606
- 2. <u>Human Biosciences 3207 or the former Biochemistry 3207</u>

11.3 Chemistry

www.mun.ca/chem

The following undergraduate programs are available in the Department:

- 1. Applied Mathematics and Chemistry Joint Honours
- 2. Biochemistry_Chemistry and Earth Sciences Joint Honours
- 3. <u>Chemistry and Human Biosciences Joint Honours</u>
- 4. <u>Chemistry and Physics Joint Honours</u>
- Major or Honours in Chemistry. (Option to complete a Minor in Applied Science Process Engineering) (see Faculty of Engineering and Applied Science for details)
 Minor in Chemistry.
- 6. <u>Minor in Chemistry</u>

Minor in Chemistry for Faculty of Engineering Process Engineering Majors

- 7. <u>Major</u> or <u>Honours</u> in Computational Chemistry
- 8. <u>Major</u> or <u>Honours</u> in Chemistry (Biological)

The Majors and Honours in Chemistry and Chemistry(Biological), and the Joint Honours with Applied Mathematics, Biochemistry, Earth Sciences, <u>Human Biosciences</u> and Physics are accredited by the Canadian Society for Chemistry.

Details of joint programs are given under **Joint Programs**.

Chemistry course descriptions are found at the end of the Faculty of Science section under **Course Descriptions, Chemistry**.

11.3.4 General Degree - Major in Chemistry

Students wishing to take a Major in Chemistry should consult those regulations of the Calendar dealing with **Degree Regulations** for the General Degree of Bachelor of Science. The courses required for a Major in Chemistry are:

- 1. Chemistry 1050 and 1051 (or 1200 and 1001), 2100, 2210, 2301, 2302, 2400, 2401, 3110, 3210, 3 211, 3303, and 3411.
- 2. Physics 1050 (or 1020) and 1051 (or 1021).
- 3. Mathematics 1000, 1001, 2000, and 2050.
- 4. <u>Human Biosciences 2001 or the former Biochemistry 2101 or the former 2201, and Human</u> Biosciences 2901 or the former Biochemistry 2901.

Recommended courses: Mathematics 2051 and Mathematics 2260, Physics 2820 and/or 2750. Students considering declaring Chemistry as their Major are encouraged to contact either the Head of the Department or the Deputy Head (Undergraduate Studies).

Chemistry Majors may complete a minor in <u>Applied Science - Process Engineering</u>. The requirements for this minor are detailed under <u>Faculty of Engineering and Applied Science</u>, <u>Minor in Applied Science -</u> <u>Process Engineering</u>.

11.3.5.1 Required Courses

- CHEM 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.
- 2. 12 credit hours selected from the 4000 level Chemistry courses chosen in consultation with the 490A/B supervisor for chemistry.
- 3. Physics 1050 (or 1020) and 1051 (or 1021).
- 4. Mathematics 1000, 1001, 2000, and 2050.
- 5. <u>Human Biosciences 2001 or the former Biochemistry 2101 or the former 2201, and Human Biosciences 2901 or the former Biochemistry 2901.</u>

Chemistry Honours students may complete a minor in <u>Applied Science - Process Engineering</u>. The requirements for this minor are detailed under <u>Faculty of Engineering and Applied Science, Minor in</u> <u>Applied Science - Process Engineering</u>.

11.3.5.2 Other Information

 Those courses in which a grade of B or an average of 75% or higher are required, as specified under <u>Academic Standing</u> in the <u>Degree Regulations</u> for the Honours Degree of Bachelor of Science, are the courses beyond first year used to satisfy clause 1. under <u>Reguired</u> <u>Courses</u> above.

- 2. Recommended courses: Mathematics 2051 and Mathematics 2260, Physics 2820 and/or 2750.
- 3. A thesis based on a selected research topic carried out under the supervision of a member of the Department is to be submitted in the final year.
- 4. Chemistry 490A/B will normally require the equivalent of nine hours per week for two semesters. Registration in Chemistry 490A/B is normally restricted to those students who have honours standing. The Honours dissertation will be assessed by a committee comprising the supervisor and one other faculty member.
- 5. With approval of the Heads of the Chemistry and <u>Biochemistry Human Biosciences</u> Departments prior to registration, a number of courses in <u>Biochemistry Human Biosciences</u> may be substituted for a like number of Chemistry courses.
- 6. Prospective Honours students in Chemistry in their first year should take
 - a. Six credit hours in <u>Critical Reading and Writing (CRW)</u> courses, including at least 3 credit hours in English courses.
 - b. Chemistry 1050 and 1051 (or 1200 and 1001).
 - c. Physics 1050 and 1051 or 1020 and 1021.
 - d. Mathematics 1000 and 1001.
 - e. Six credit hours in other courses.
- 7. Students should consult the <u>Undergraduate Student Handbook</u> for timetabling details.
- Students completing first year requirements for either Chemistry or Mathematics via the three course options (i.e. Chemistry 1010, 1050, 1051, Mathematics 1090, 1000, 1001 (or 109A/B, 1000, 1001) instead of the two course options (Chemistry 1050, 1051, Mathematics 1000, 1001) will require the corresponding number of extra credits to obtain an Honours degree.
- 9. Arrangements for subsequent years will depend on the other science subjects being studied and should be made in consultation with the Faculty Advisor.
- 10. Certain advanced courses may only be offered in alternate years. Students therefore should consult the Head of the Department before registration.
- 11. Certain Graduate courses may be taken in the final year of the Honours Program with the permission of the Head of the Department.
- 12. Details of Joint Honours programs with Biochemistry, Earth Sciences, <u>Human Biosciences</u>, Mathematics and Physics are outlined under <u>Joint Programs</u>.
- 13. Details of the Environmental Science (Chemistry Stream) Major or Honours are outlined under the **<u>Grenfell Campus</u>** section of the Calendar.

11.3.8 General Degree in Chemistry (Biological) 11.3.8.1 Required Courses

- 1. Chemistry 1050 and 1051, 2100, 2210, 2301, 2302, 2400, 2401, 3110, 3211, and 4410.
- 2. At least 6 credit hours from Chemistry 3210, 3303, 3411 or any 4000-level Chemistry course.
- Biology 1001, 1002, 2250, 2060, and 3050 and at least 6 credit hours chosen from Biology 3530, 3950, 3951, 4010, 4050, 4200, 4245, 4251, 4404, 4605, Ocean Sciences 3002 and 3600.
- Human Biosciences 2001 or the former Biochemistry 2101 or the former 2201, Human Biosciences 2901 or the former Biochemistry 2901 and at least 6 credit hours from Human Biosciences 2003, 3105, 3207, 4101, and 4201, or the former Biochemistry 3105, 3206 or 3106, 3207 or 3107, 4101, and 4201.
- 5. Mathematics 1000 and 1001. Statistics 2550 is strongly recommended.
- 6. Physics 1050 (or 1020) and Physics 1051 (or 1021).
- Six credit hours in <u>Critical Reading and Writing (CRW)</u> courses, including at least 3 credit hours in English courses.

11.3.9 Honours Degree in Chemistry (Biological) 11.3.9.1 Required Courses

- 1. Chemistry 1050 and 1051, 2100, 2210, 2301, 2302, 2400, 2401, 3110, 3211, 4410 and 490A/B.
- 2. At least 3 credit hours from Chemistry 3210, 3303, 3411 or any 4000-level Chemistry course not used to fulfill clause 3. below.
- 3. At least 3 credit hours from Chemistry 4151, 4201, 4206, 4305, or 4701.
- 4. Biology 1001, 1002, 2060, 2250, and 3050 and at least 6 credit hours chosen from Biology 3530, 3950, 3951, 4010, 4050, 4200, 4245, 4251, 4404, 4605, Ocean Sciences 3002 and 3600.
- 5. Human Biosciences 2001 or the former Biochemistry 2101 or the former 2201, Human Biosciences 2901 or the former Biochemistry 2901 and at least 6 credit hours from Human Biosciences 2003, 3105, 3207, 4101, and 4201, or the former Biochemistry 3105, 3206 or 3106, 3207 or 3107, 4101, and 4201.
- 6. Mathematics 1000 and 1001. Statistics 2550 is strongly recommended.
- 7. Physics 1050 (or 1020) and Physics 1051 (or 1021).
- 8. Six credit hours in **Critical Reading and Writing (CRW)** courses, including at least 3 credit hours in English courses.

11.9 Ocean Sciences

11.9.2 Minor in Sustainable Aquaculture and Fisheries Ecology

Students who take a Minor in Sustainable Aquaculture and Fisheries Ecology will complete 24 credit hours as follows:

- 1. Ocean Sciences 1000, 2001, 3000, 3002, 4300;
- 2. six credit hours selected from: Ocean Sciences 2000 (or Biology 3710), 3600, 3640, 4000, 4122, 4200, 4601, or other applicable courses at the 3000 level or above, as approved by the Head of the Department or delegate;
- 3. three credit hours selected from:
 - a. Biology 2122, 3401, 3640, 3715, 4251, 4605, 4750;
 - Human Biosciences 3101, 3207, 3402, 4002, 4101, 4104, 4200, 4201 or the former b. Biochemistry 3107 or 3207, 3402, 4002, 4101, 4104, 4105, 4200, 4201;
 - c. Geography 4300.

Course prerequisites stipulated in the **Course Descriptions** shall apply to the Minor in Sustainable Aquaculture and Fisheries Ecology.

11.9.4.2 Program Regulations for the Honours in Ocean Sciences

Students must successfully complete:

- 1. the 30 credit hours required under Admission Requirements for the Major in Ocean Sciences or the Major in Ocean Sciences (Environmental Systems);
- 2. Chemistry 2400 (or equivalent). Chemistry 2440 will be accepted as a substitute for Chemistry 2400. However, a number of advanced Science courses may require Chemistry 2400 and 2401. Students are therefore strongly encouraged to successfully complete the Chemistry 2400/2401 sequence or otherwise carefully plan their options;
- 3. Physics 1021 or 1051:
- 4. Statistics 2550 or any of the courses listed in the credit restrictions of Statistics 2550;
- 5. a minimum of 12 credit hours chosen from:
 - a. Biology 2060, 2122, 2250, 2600, 2900;
 - b. Human Biosciences 2001, 2003, 2004, 3004, 3207, or the former Biochemistry 2100, 2101 or the former 2201, 3106 or 3206, 3107 or 3207, 3108;
- 6. a minimum of 45 credit hours in Ocean Sciences, including:
 - a. Ocean Sciences 2000 (or Biology 3710), 2001, 2100, 2200, 2300 and at least one of 2500 or 4500 (or Biology 4710). Ocean Sciences 1000, successfully completed under Admission Requirements for the Major in Ocean Sciences or the Major in Ocean Sciences (Environmental Systems), will count as 3 of the required 45 credit hours in Ocean Sciences;
 - b. at least 18 credit hours in Ocean Sciences courses at the 3000 and/or 4000 level.
 - c. Ocean Sciences 499A/B; and

elective courses as necessary to make up the total of 120 credit hours including a minimum of 15 credit hours at the 3000 and/or 4000 level in any of Biochemistry, Biology, Chemistry, Earth Sciences, Environmental Science, Geography, <u>Human Biosciences</u>, Ocean Sciences or Physics (these 15 credit hours can include courses completed as part of the requirements in 5.b. but not those required as part of 6. above).

Those courses in which a grade "B" or an average of 75% or higher are required to graduate with an Honours degree as per clause 1. of <u>Academic Standing</u> in the <u>Degree Regulations</u> for the Honours Degree of Bachelor of Science, are the Ocean Sciences courses at the 2000, 3000 and/or 4000 level, and 15 credit hours in courses at the 3000 and/or 4000 level in any of Biochemistry, Biology, Chemistry, Earth Sciences, Environmental Science, Geography, <u>Human Biosciences</u>, or Physics.

Students should be aware of a number of credit restrictions and refer to the **<u>Course Descriptions</u>** section for information.

11.10 Physics and Physical Oceanography

www.mun.ca/physics

The following undergraduate programs are available in the Department:

- 1. Applied Mathematics and Physics Joint Honours
- 2. Applied Mathematics and Physics Joint Major
- 3. Biochemistry Chemistry and Physics Joint Honours
- 4. <u>Computer Science and Physics Joint Honours</u>
- 5. Computer Science and Physics Joint Major
- 6. Earth Sciences and Physics Joint Honours
- 7. Earth Sciences and Physics Joint Major
- 8. <u>Geophysics and Physical Oceanography Joint Honours</u>
- 9. Human Biosciences, and Physics Joint Honours
- 10. <u>Honours in Environmental Physics</u>
- 11. Honours in Ocean Physics
- 12. Honours in Physics
- 13. <u>Major in Environmental Physics</u>
- 14. Major in Ocean Physics
- 15. Major in Physics
- 16. <u>Minor in Applied Science Electrical Engineering for Majors and Honours (see Faculty of Engineering</u> and Applied Science)
- 17. Minor in Physics

Details of Joint Major and Joint Honours programs are given under **Joint Program Regulations**. Other joint programs may be arranged in consultation with the departments concerned.

Physics and Physical Oceanography course descriptions are found at the end of the Faculty of Science section under **Course Descriptions**, **Physics and Physical Oceanography**.

11.10.1 Minor in Physics

A minor in Physics will consist of 24 credit hours in Physics courses which must include

Physics 1050 (or 1020), 1051, 2053, 2055, 2750, 2820. Only 6 credit hours at the 1000 level can be used to fulfill the 24 credit hours. For those students whose major is Chemistry or Biochemistry Human Biosciences, the 24 credit hours in Physics will not include 2053.

For Computer Engineering and Electrical Engineering students, 24 credit hours in Physics which must include Physics 1050 (or 1020), 1051, 2750, and 3000, with an additional 12 credit hours selected from Physics 2820, 3600, 3750, 3751, 3800, 4000, 4220, 4600 or other 3000 or 4000 level courses subject to approval by the Head of the Department of Physics and Physical Oceanography and the Head of the Department of Electrical and Computer Engineering.

11.11 Psychology

www.mun.ca/psychology

The following undergraduate programs are available in the Department.

1. Biology and Psychology (Behavioural Neuroscience) Joint Honours (B.Sc. only)

- 2. Biology and Psychology Joint Honours (B.Sc. only)
- 3. <u>Human Biosciences</u> and Psychology (Behavioural Neuroscience) Joint Honours (B.Sc. only)
- 4. Major and Honours in Behavioural Neuroscience (B.Sc. only)
- 5. Major and Honours in Behavioural Neuroscience (Co-operative) (B.Sc. only)
- 6. Major and Honours in Psychology (B.A. or B.Sc.)
- 7. Major and Honours in Psychology (Co-operative) (B.A. or B.Sc.)
- 8. Minor in Psychology (B.A. or B.Sc.)

Details of Joint Honours programs are given under **Joint Program Regulations**.

Psychology course descriptions are found at the end of the Faculty of Science section under **Course Descriptions, Psychology**.

11.11.4 Requirements for a Major in Psychology

Students completing this program cannot receive credit for Psychology 2920. Students who intend to pursue graduate studies should take courses leading to the Honours degree.

- Students may Major in Psychology as part of either a B.A. or a B.Sc. program, and should consult the Degree Regulations for the General Degree of Bachelor of Science or the Degree Regulations for the General Degree of Bachelor of Arts, as appropriate. All Majors are required to complete a minimum of 42 credit hours of Psychology as listed below:
 - a. Psychology 1000, 1001, 2520 (or 2521), 2910, 2911, 2930.
 - Twelve credit hours in Psychology chosen from the following: 3050, 3100, the former PSYC 3250, 3251, 3350, 3450, 3620, 3650, 3750, or one of 3800, 3810, 3820, 3830, 3840 or 3860.
 - c. Twelve credit hours of 4000-level courses in Psychology, of which at least one must be a research experience course and one must be a selected topics course.
- 2. Psychology Majors following the B.Sc. program are also required to successfully complete the following:
 - a. Mathematics 1000 (or equivalent).
 - b. Biology 1001 and 1002.
 - c. Either Chemistry 1050 and 1051 (or 1200 and 1001 or 1010 and the former 1011); or Physics 1020 (or 1050) and 1021 (or 1051).

Note:

First year students should think carefully about whether Chemistry or Physics best suits their future program

needs. Students should examine the prerequisites for upper-level science courses and attempt to take them in

their first year.

d. Six credit hours of laboratory courses at the 2000 level or above in one of Biochemistry, Biology, Chemistry, Computer Science, <u>Human Biosciences</u>, Ocean Sciences or Physics. Students are advised to consult the **Course Descriptions** section of the Calendar for their chosen lab courses to ensure pre-requisites are met.

Note:

Biology/Psychology 3750 and 4701 and Biology 3053 cannot be used to satisfy the requirement of 6 laboratory

credit hours at the 2000 level or above.

3. Psychology Majors following the B.A. program are also required to successfully complete Mathematics 1000 or two of 1090, 1050, 1051 (or equivalent), and are encouraged to complete at least 6 credit hours in Biology.

11.11.6 Requirements for a Major in Behavioural Neuroscience (B.Sc. Only)

Students completing this program cannot receive credit for Psychology 2920.

A program is offered in the Psychology Department to provide an education in Behavioural Neuroscience. Students planning to enroll in the program are advised to consult with the Head of the Department at the earliest opportunity because certain course choices may restrict later options. Students who intend to pursue graduate studies should take courses leading to the Honours degree. As a component of the **Degree Regulations** for the General Degree of Bachelor of Science, the program for a Major in Behavioural Neuroscience shall include:

- 1.
- a. Psychology 1000, 1001, 2521, 2910, 2911, 2930, 3800, 3820, and one of 3810, 3830, 3840, or 3860.
- b. Three credit hours in Psychology chosen from the following: 3050, 3100, the former 3250, 3251, 3350, 3450, 3620, 3650, 3750.
- c. Any research experience course and one of Psychology 4250, 4251, 4850, 4851, 4852, 4853, or 4854; or, any selected topics course and Psychology 4870.
- 2.
- a. Mathematics 1000 (or equivalent).
- b. Chemistry 1050 and 1051 (or 1200 and 1001).
- c. Physics 1020 (or 1050) and 1021 (or 1051).
- d. Biology 1001 and 1002.
- e. Six credit hours in **Critical Reading and Writing (CRW)** courses, including at least 3 credit hours in English courses.
- 3. Eighteen credit hours from the following courses chosen from at least two different sciences:
 - a. Biology: Any 2000-, 3000-, or 4000-level course except 2040, 2041, 2120, 3053, or 3820.
 - b. Chemistry: 2100, 2210, 2301 (or the former Chemistry 2300), 2302, 2400, 2401, 2610, or any 3000 or 4000 level course.
 - c. Computer Science: Any 2000, 3000, or 4000 level course except the former 2650 and the former 2801.
 - d. <u>BiochemistryHuman Biosciences</u>: Any 2000-, 3000-, or 4000-level course except the former <u>Biochemistry</u> 2000, 2005, the former 2010, the former 2011, 3202, 3402, or 4502.
 - e.
 - f. Ocean Sciences: any 2000-, 3000-, or 4000-level course.
 - g. Mathematics: 2000, 2050, 2051, 3000, 3001 or any 3000 or 4000 level pure or applied mathematics course.
 - h. Medicine 310A/B.
 - i. Physics: Any 2000, 3000, or 4000 level course except 2151, 3150, 3151.

Notes:

j. Credit may not be obtained for both Biology 3750 and Psychology 3750 or for both

Biology 4701 and Psychology 4701.

k. The courses listed under Clause 3 may have prerequisites. It is the student's responsibility to

ensure that all prerequisites have been met, or that waivers have been obtained, before

registering for these courses.

13.2 Biology

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.

- CR: the former BIOL 3060
- LH: 3

PR: Science 1807 and Science 1808; BIOL 2250 or <u>Human Biosciences 2004 or the former</u> <u>Biochemistry 2100 or 2200</u>

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.

CR: the former Biochemistry 2100 or 2200, the former BIOL 3250

LH: 3

PR: Science 1807 and Science 1808; BIOL 1001 and 1002; Chemistry 1050 (or Chemistry 1200) **3052**

Food Microbiology

(same as BiochemistryHuman Biosciences 3052) is the study of the microbiology of water and food with regard to the beneficial and detrimental roles of microorganisms on interaction with these systems. Emphasis will be on the microbiology of food, fermentations, food spoilage and food borne vectors of human disease.

CR: <u>Human Biosciences</u> Biochemistry 3052 and the former Biochemistry 3052, 3054, Biochemistry 3401

- LC: three hours per week
- LH: three hours per week

PR: Science 1807 and Science 1808; BIOL 3050

3401

Comparative Animal Physiology

is a comparative study of the basic physiological processes, with special attention paid to those strategies invoked by animals which enable them to adapt to environmental changes.

CO: <u>Human Biosciences 2003 or the former</u> Biochemistry 3106 or 3206

CR: the former BIOL 4401

LH: 3

PR: Science 1807 and Science 1808; BIOL 2060 and 2210

PR: Biochemistry 3106 or 3206

3402

Principles of Plant Physiology

is a consideration of the principles of plant physiology, including water relations, nutrition, metabolism, growth and development.

CO: <u>Human Biosciences 2003 or the former</u> Biochemistry 3106 or 3206

CR: the former BIOL 4403

LH: 3

PR: Science 1807 and Science 1808; BIOL 2010 and 2060

PR: Biochemistry 3106 or 3206

3530

Molecular and Developmental Biology

is a study of developmental model systems with a focus on the underlying principles and molecular mechanisms involved in embryogenesis, organogenesis, morphogenesis, cellular differentiation, growth and regeneration in animals (vertebrates and invertebrates) and plants. Current cellular and molecular biology techniques and the implications of developmental biology in modern biological and health research will be emphasized.

LH: 3

PR: Science 1807 and Science 1808; BIOL 2060 and BIOL 2250 or <u>Human Biosciences 2004 or the former</u> Biochemistry 2100 or Biochemistry 2200

3640

Environmental Physiology of Animals

(same as Ocean Sciences 3640) covers physiological adaptations of animals facilitating their survival in natural environments with emphasis on physiological and biochemical responses of animals to extreme environments. Starting with the fundamental basis of physiological mechanisms, the course explores various aspects and the integration of major physiological processes (metabolism, respiration, osmoregulation) and how these relate to ecological niche.

CR: the former BIOL 3403 or the former BIOL 4455, Ocean Sciences 3640

PR: BIOL 2060; Human Biosciences 2003 or the former Biochemistry 3106 or 3206

UL: may not be used to fulfill the physiology course requirement for a Biology major, honours or joint honours program.

4200

Immunology

(same as Biochemistry 4105 Human Biosciences 3101 and Pharmacy 3006) is an introduction to the cells and organs of the innate and adaptive immune systems. The molecular and cellular basis of allergy, autoimmunity, vaccination and cancer immunology will also be discussed.

CR: <u>Human Biosciences 3101 or the former Biochemistry 4105</u>, Pharmacy 3006, and the former Pharmacy 4105

PR: <u>Human Biosciences 2001 or the former Biochemistry 2101</u> or the former 2201 **4241**

Advanced Genetics

has advanced topics in modern genetic analysis, including regulation of gene expression, developmental genetics, molecular basis of inherited disease, genomics, immunogenetics, behavioural genetics, and molecular evolution.

LH: 3

PR: Science 1807 and Science 1808; BIOL 2250 and Human Biosciences 2001 or the former Biochemistry 2101 or the former 2201

4245 Biophysi

Biophysics

is an examination of the physical properties involved in defining diffusion, membrane properties, electrochemical potentials and the processes of bioenergetics within cells and organelles. Selected topics in biomechanics and the functioning of whole organisms with respect to size, shape, support, orientation, transport and motility.

LH: 3

PR: Science 1807 and Science 1808; BIOL 2060 and Human Biosciences 2001 or the former Biochemistry $\underline{2101}$ or the former $\underline{2201}$

4550

Principles of Endocrinology

comprises an introduction to basic concepts concerned with how chemical messages are transmitted and received between cells to coordinate body functions. Hormonal control of adaptation, reproduction, metabolism, growth, digestion, and electrolyte homeostasis will be discussed. Although the endocrinology of invertebrates and lower vertebrates will be mentioned as appropriate, the main emphasis will be on mammalian and human endocrinology at the level of the whole organism. LH: 3

PR: Science 1807 and Science 1808; BIOL 3401; <u>Human Biosciences 2003 or the former</u> Biochemistry 3106 or 3206

13.3 Chemistry

4701

Principles of Pharmaceutical Chemistry

will provide the necessary foundation of knowledge to enable students to understand the principles of drug discovery, the main pharmacokinetics properties of drugs, the relationships between the chemical structure of drugs and their biological actions, their toxicity and side-effects, and the kinetics of inhibitory mechanisms and the metabolic reactions of drugs. It will also provide an overview of pharmaceutical regulatory affairs. PR: <u>Human Biosciences 3105 or the former Biochemistry 3105 or CHEM 3411 or permission of the instructor</u>

13.5 Earth Sciences

4302

Advanced Marine Geology

examines the geology and geophysics of ocean basins; discussion of methods of oceanic exploration, the history and development of ocean basins, interrelationships between ocean water, marine organisms, sedimentary and igneous processes.

PR: EASC 1001 or 1002 and completion of any 15 credit hours in core courses at the 3000 and/or 4000 levels (see General Note 5) in Biology, Biochemistry, Chemistry, Earth Sciences, Human Biosciences, Physics, or Geography.

4903

Global Change

is a lecture and seminar course that studies the interaction of the atmosphere, biosphere and lithosphere; topics covered include the evolution of the biosphere, fluid circulation, global geochemical budget, global environmental changes, and chemical evolution of the hydrosphere.

OR: seminar

PR: EASC 1001 or 1002, and Biology 2120 (or Biology 1001 and 1002); and completion of any 15 credit hours in core courses at the 3000 and/or 4000 levels (see General Note 5) in Biology, Biochemistry, Chemistry, Earth Sciences, <u>Human Biosciences</u>, or Physics; or permission of the instructor.

13.9 Ocean Sciences

3002

Aquaculture and Fisheries Biotechnology

is an introduction to biotechnology and genetics as they are applied to aquaculture and fisheries. Topics covered include genetic variation; genetic structure of fish and shellfish populations; the genetic basis of aquaculture traits; finfish and shellfish genomic research; marker-assisted selection in aquaculture; manipulation of ploidy; genetic engineering in aquaculture; and techniques used to study the responses of aquatic animals to external stressors such as hypoxia, temperature stress, acidification, and pathogens. PR: Biology 2250 or <u>Human Biosciences 2004 or the former Biochemistry 2100 or Biochemistry 2200</u> **3600**

Marine Microbiology

provides an overview of microbial activity in the ocean, both in natural and applied settings. The focus is on interactions between microorganisms and other biota, ranging from deep-sea vent invertebrates to commercially cultured fish species. Prospective topics include effluent discharge, water quality, bacterial metabolism and nutrient cycles, bacteria-virus and bacteria-host interactions (including symbioses and pathogenesis), and marine microbial biotechnology.

PR: Biology 2250 or <u>Human Biosciences 2004 or the former Biochemistry 2100 or Biochemistry 2200</u> 3640

Environmental Physiology of Animals

(same as Biology 3640) covers physiological adaptations of animals facilitating their survival in natural environments with emphasis on physiological and biochemical responses of animals to extreme environments. Starting with the fundamental basis of physiological mechanisms, the course explores various aspects and the integration of major physiological processes (metabolism, respiration, osmoregulation) and how these relate to ecological niche.

CR: the former Biology 3403 or the former Biology 4455, Biology 3640

PR: Biology 2060; Human Biosciences 2003 or the former Biochemistry 3106 or 3206

UL: may not be used to fulfill the physiology course requirement for a Biology major, honours or joint honours program

4200

Marine Omics

provides an overview of marine genomics, transcriptomics, proteomics, glycomics, metabolomics, and lipidomics. Omics-based studies of a variety of marine organisms (e.g. fungi, algae, animals), as well as several industrial applications (e.g. biofuel, nutrigenomics, pharmacogenomics, aquaculture and fisheries), will be considered.

PR: OCSC 1000 and Biology 2250 (or <u>Human Biosciences 2004 or the former Biochemistry 2100 or 2200</u>), or OCSC 3002

School of Human Kinetics and Recreation

12 Course Descriptions

2600

Introduction to Human Nutrition

(same as <u>Human Biosciences 2002 Biochemistry 2600</u>) gives an overview of human nutrition with an emphasis on topics of current interest. Students will gain an understanding of nutrition in the context of health maintenance across the life span. Topics covered will include nutrition during pregnancy, nutrition for infants, Canadian Recommended Nutrient Intake/Dietary Reference Intake, weight loss and weight gain, nutriceuticals, and ergogenic aids.

CR: Human Biosciences 2002 or the former Biochemistry 2600

3310

Physiology of Exercise

covers the physiological responses of the metabolic, neuromuscular, and cardiorespiratory systems at rest and during acute and chronic activity.

LH: 3

PR: HKR 2310 and 2320; or Biochemistry 311A and 311B Medicine 310A and 310B; or Nursing 1002 and 1012; or the former Pharmacy 3201 and 3202

Faculty of Medicine

12.6 Courses Offered By the Faculty of Medicine for Non-Medical

Students

310A and 310B Human Physiology

covers the properties of nerve and muscle cells, the special senses, blood and body fluids, and the nervous, cardiovascular, digestive, immune, respiratory, urinary, endocrine and reproductive systems. Integration of the body's systems in maintaining homeostasis is emphasized. Priority for entry into this course is given to Biochemistry, Human Biosciences, Nutrition, Dietetics, and other students who are interested in experimental science.

CH: 6

CO: Human Biosciences 2001 or the former Biochemistry 2101 or the former 2201

CR: The former Biochemistry 311A/B

LH: to be specified

Faculty of Nursing

14 Course Descriptions

2003

Pathophysiology

presents general concepts of disease processes and their impact on health. The course focuses on major pathophysiologic changes, including associated etiology, pathogenesis and clinical manifestations. Common illnesses are studied to illustrate these disease processes.

CO: NURS 2004

OR: tutorial 1.5 hours per week

PR: NURS 1012, 1014, 1015, 1016, 1520, and Biochemistry Human Biosciences 1430 or the former Biochemistry 1430

2004

Pharmacology

explores principles and concepts in the use medications for the management of common health problems across the lifespan. Nursing considerations and psychomotor competencies pertinent to traditional pharmaceuticals and commonly used natural health products (NHPs) are addressed. CO: NURS 2003

LH: 2

PR: NURS 1012, 1014, 1015, 1016, 1017, 1520, and Biochemistry Human Biosciences 1430 or the former Biochemistry 1430

School of Pharmacy

12 Course Descriptions

2004

Introduction to Biochemistry

is an introduction to the major organic substances of living organisms, proteins, carbohydrates and lipids: their structure, analysis and biochemical function. Other topics include: enzymes; the biochemistry of membranes, including the plasma membrane and specialized intracellular membranes; and the biochemistry of selected differentiated cells.

CR: <u>Human Biosciences 2001 or the former Biochemistry 2101</u> or the former 2201 PR: Chemistry 2400 and Physics 1020 (or 1050), and 1021 (or 1051) **3006**

Immunology

(same as <u>Human Biosciences 3101Biochemistry 4105</u> and Biology 4200) is an introduction to the cells and organs of the innate and adaptive immune systems. The molecular and cellular basis of allergy, autoimmunity, vaccination and cancer immunology will also be discussed.

CR: <u>Human Biosciences 3101 or the former Biochemistry 4105</u>, Biology 4200, and the former PHAR 4105 PR: PHAR 2004

3111

General Biochemistry

covers the catabolism of carbohydrates, lipids and amino acids. Mitochondria, chloroplasts and ATP synthesis. Biosynthesis of carbohydrates and lipids. Metabolic specialization of differentiated cells and tissues. Integration of metabolism.

CR: Human Biosciences 2003 or the former Biochemistry 3106 or - 3206

PR: one of PHAR 2004, Human Biosciences 2001 or the former Biochemistry 2101 or the former 2201

Paper 5.A.y. (pages 197-349)

APPENDIX 5

Consultation Emails

Table of Contents: Consultation Feedback and Responses (with hyperlinks)

Original email seeking consultation Ocean Sciences Music Physics and Physical Oceanography Engineering Pharmacy Psychology HKR Medicine Science and Environment (Grenfell) Biology (Part I) Biology (Part II)

BiocDHundergrad

Reply Thu 10/20/2022 3:32 PM To: Faculty of Humanities and Social Sciences; Oldford, Erin; Furey, Edith; <u>engrconsult@mun.ca</u>; HKR Dean; <u>deanofmedicine@med.mun.ca</u>; Karen Bulmer; DeanNurse; <u>pharminfo@mun.ca</u>; Dean of Science; adeanugradswk; Library Correspondence; <u>kjacobse@grenfell.mun.ca</u>; <u>ssedean@grenfell.mun.ca</u>; <u>thennessey@grenfell.mun.ca</u>; miugconsultations@mi.mun.ca; Ashlee Cunsolo; Biochemistry Head Cc: <u>jbrunton@mun.ca</u>; Todd, Amy M. You forwarded this message on 10/28/2022 3:13 PM

Human Biosciences Program Proposal.pdf2 MB

Hello All,

The Department of Biochemistry is seeking input on a proposal for a new undergraduate program, <u>Human Biosciences</u>, which will replace our current programs in Biochemistry and Biochemistry (Nutrition).

Overview: Following a formal AUP process and review of our curriculum, we engaged CITL to assist us in identifying the the core concepts and overall learning objectives that we wanted our graduates to have mastered at the end of their programs. Our curriculum review identified very few differences in program learning outcomes between our two programs. Through the

CITL-led process, we identified that a single interdisciplinary program in "Human Biosciences" would provide a more efficient, modernized program that would address the growing pedagogical demand for interdisciplinary programs.

The Human Biosciences program proposes a common core set of courses in 2nd and 3rd year, with the opportunity to follow a "concentration" of interest through the choice of specialized courses at the higher levels. A number of new, integrated courses are proposed to contribute to the core content along with some existing courses (that will be renamed as Human Biosciences courses). Joint Honours programs are also proposed, similar to those currently shared with Biochemistry. We are in the process of setting up meetings with Academic Units that will be impacted by the new program and new course codes.

The secondary calendar changes related to this proposal will be extensive and included in the package is our first draft; we would sincerely appreciate it if, in your feedback, you would identify any errors and/or omissions that you find.

We look forward to receiving comments by November 17th. Please email comments directly to jbrunton@mun.ca

Thanks so much!

Janet

Janet Brunton, PhD Professor and Deputy Head (Undergraduate) Department of Biochemistry Memorial University of Newfoundland St. John's, NL

phone 709 864-8533

OCEAN SCIENCES Feedback

Hi Mark,

Thank you for the opportunity to provide feedback on the Biochemistry proposal and sorry for the delay in responding. The Department of Ocean Sciences has no concerns with it.

Best Pat

Dr. Patrick Gagnon Professor and Deputy Head (Undergraduate) Department of Ocean Sciences Ocean Sciences Centre, Memorial University of Newfoundland St. John's, NL, A1C 5S7, Canada

Tel: (709) 864-7663 Fax: (709) 864-3220 Email: <u>pgagnon@mun.ca</u>

MUSIC feedback

Dear Janet,

Thank you for the opportunity to review the proposed new undergraduate program offering from the Department of Biochemistry, Human Biosciences. Music has no substantive comments. The new, revised degree offerings, offered through an interdisciplinary lens, look excellent.

This represents a tremendous amount of work for faculty and staff in biochemistry. Congratulations to you all!

I did not find any errors or omissions in the secondary calendar changes, but will confess that I did not read through appendix 3 thoroughly.

Best wishes, Michelle Cheramy

Michelle Cheramy, DMA (she/her) Acting Associate Dean (academic), School of Music Memorial University of Newfoundland St. John's, NL, Canada <u>mcheramy@mun.ca</u>

PHYSICS & PHYSICAL OCEANOGRAPHY Feedback

------ Original Message ------Subject: Re: New Program Consultation Date: 2022-11-16 12:16 From: Ivan Saika-Voivod <<u>saika@mun.ca</u>> To: <u>jbrunton@mun.ca</u>

Dear Dr. Brunton,

Thank you for the opportunity to provide feedback on Biochemisty's proposed program changes. Our Undergraduate Studies Committee has reviewed the proposals and has a few comments.

We note your department's admirable efforts to work together with CITL to take stock of program outcomes, rebrand, and improve programs. The name change is striking and possibly unique in Canada.

A cursory review of biochemistry programs at Canadian universities reveals that some programs require physics, some do not, and some include it as an option. It is therefore understandable, but disappointing, that you have chosen to remove all physics requirements from your programs, especially since many students struggle with the challenge of developing the quantitative analytical skills required to formulate precise descriptions of physical systems. With the removal of physics, however, students will have a narrower background in science. They will lack a fundamental understanding of energy and other physical concepts important in biosciences.

Is the removal of physics in the best interest of students?

With regard to the joint honours program with Physics, we note that you have increased the number of courses required by Biochem/HUBI to the same number as required by Physics. While this is fair in some sense, the result, by our count, is that 117 of 120 credit hours are now prescribed, leaving room for just a single elective course. It may be difficult for students to complete this program in four years.

Best regards, Ivan

Dr. Ivan Saika-Voivod, Professor

Chair, Undergraduate Studies Committee Department of Physics and Physical Oceanography, Memorial University of Newfoundland Tel: 709-864-8886, Fax: 709-864-8739, <u>http://www.physics.mun.ca/~saika/</u>

Department reply

Hi Ivan

Thanks for the feedback. Below is our "official" response, basically what Valerie and I discussed in person with you and Len yesterday. We really do think our restructuring of the existing programs in our department in to an interdisciplinary approach opens up some exciting new collaborative avenues for us to explore with like minded departments.

All the best

Mark

We thank the Department for their support of our proposal and balanced, reasonable comments. Over the past several years we have been tracking the performance of students in our Introductory Biochemistry that are signed in without Chemistry or Physics pre-requisites. Students missing the Physics pre-requisite do not show any decrease in final grade, while those missing a Chemistry prerequisite generally score approximately 3% below students who have completed the Chemistry prerequisite

With respect to the Jt Honours, it was not our intent to increase the course content requirement, simply a counting error, and we will modify Clause 8 to "an additional 9 credit hours..." to keep the total number of required courses consistent with previous. We agree with you that the Jt Honours program is overly restrictive in terms of allowing elective choices, and we would welcome further meetings to examine decreasing the core course requirements from each department. We have in fact got a "toned down" core for this new program that is the basis of our discussions with the Faculty of Business Administration about a joint undergraduate program in Human Biosciences and Business Administration that could form a template for future discussions. As briefly discussed with Drs. Zedel and Saika-Voivod we also believe that our new program offers an opportunity to develop a new interdisciplinary undergraduate program (Biophysics + honours Biophysics) jointly offered by the two departments in the future, that could potentially replace the existing joint honours option. There are already multiple existing research collaborations between the departments, and two of our newest hires also have research programs with strong Biophysics components. While any such development would obviously require many months of curriculum planning and determining resource implications, we are certainly open and excited by such possibilities. With an established synergy on which to build, a future joint appointment for such a new programme MAY be an option to pursue should such a new program proposal come to fruition.

ENGINEERING Feedback

------ Original message ------From: Engineering Consult <<u>engrconsult@mun.ca</u>> Date: 2022-11-14 8:18 p.m. (GMT-03:30) To: BiocDHundergrad <<u>biocdhundergrad@mun.ca</u>>, <u>ibrunton@mun.ca</u> Subject: Re: New Program Consultation

Hi,

Thanks for giving us the opportunity to provide feedback on the proposal for the new program. The Faculty of Engineering and Applied Science Committee on Undergraduate Studies does not anticipate any impact of the proposed changes on engineering programs. Sincerely,

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

PHARMACY Feedback

Hi Mark,

I'm sorry I sent it to Janet on Tuesday as she had originally circulated the package for consultation, but I should probably have sent it to you directly. Here is what I had sent:

Thank you for the opportunity to comment on the proposed Human Biosciences program, and thank you in particular for actively engaging with us to ensure that the needs of our pharmacy students will still be met with respect to biochem/human biosciences content. Pharmacy strongly supports the new, modernized program and we anticipate that our students will benefit from the proposed changes in course content for those courses which are required components of our program.

Thank you, Erin --Dr. Erin Davis BSc (Pharm), PharmD Associate Dean Undergraduate Studies Associate Professor Memorial University School of Pharmacy T 709 864 8815 E emdavis@mun.ca

PSYCHOLOGY Feedback

Hi Mark and Janet,

I just looked through your package and I think that it looks great. You have clearly put a lot of thought and time into this. I think that it is something that students will be really interested in. I do not see any concerns for psychology - although Carolyn will take a closer look through it and provide some more formal feedback.

Tina

Christina Thorpe Office of the Head Psychology Department Memorial University of Newfoundland St. John's, NL, A1B 3X9 phone: 709-864-8495 fax: 709-864-2430 e-mail: psychhead@mun.ca

On 2022-11-04, 5:37 PM, "Janet Brunton" <<u>jbrunton@mun.ca</u>> wrote:

Hi Tina,

Please find the proposal attached.

Best,

Janet

On 11/4/2022 4:30 PM, Head Psychology wrote:

> Hi,

>

> I don't think that I received a copy of this. Could you forward it along to me?

>__.

> Tina

>

> Christina Thorpe

> Office of the Head

> Psychology Department

```
> Memorial University of Newfoundland
 > St. John's, NL,
 > A1B 3X9
 > phone: 709-864-8495
 > fax: 709-864-2430
 > e-mail: psychhead@mun.ca
 >
 >
 > On 2022-11-04, 4:28 PM, "Deputy Head, Department of Psychology"
<psychdeputyhead@mun.ca> wrote:
 >
 >
      Hi Mark-
 >
 >
      I am still working my way through the consultation pile we have this
 >
      term! But I've given the Human Biosciences one a quick look over and
      conceptually I think it is very appealing- and will be appealing to
 >
      students. I don't think anything has really changed significantly
 >
      regarding the Joint Honours program on our side of the house- with the
 >
      exception of one of the Joint Honours programs (i.e., Biochem
 >
      (Nutrition) and Psychology (BHNR)) being removed- so I am happy enough
 >
 >
      with this to go forward.
 >
      I can send Janet some formal consultation comments to include on Monday
 >
      or Tuesday (Tina and I will confer before that).
 >
 >
 >
      Enjoy the Friday beers!
 >
 >
      Best,
      Carolyn
 >
 >
 >
      On 2022-11-04 16:00, Biochemistry Head wrote:
 >
      > Hi Christina and Carolyn
 >
 >
      >
      > Sorry don't know who on your end handles consults, so you're both
 >
 >
      > getting harassed right before Friday beers.
      >
  >
      > Just wondering if you've had chance to look at our program
 >
      > modernization proposal, and if so if there were any
 >
      > guestions/comments. We're happy to meet to address any guestions you
 >
      > may have, but to do that and incorporate any agreed changes we'd
 >
      > need to do that pretty quick for them to be in the package that goes
 >
      > to FoSCugs and onwards.
 >
 >
      >
```

```
>
    > Cheers
>
    >
>
    > Mark
>
>
    ---
    Carolyn Walsh, PhD (she/her)
>
    Associate Professor
>
    Deputy Head, Psychology
>
    Memorial University
>
    St. John's, NL,
>
    A1B 3X9
>
    phone: 709-864-4738
>
    fax: 709-864-2430
>
>
    e-mail: psychdeputyhead@mun.ca
>
    We acknowledge that the lands on which Memorial University's campuses
>
    are situated are in the traditional territories of diverse Indigenous
>
    groups, and we acknowledge with respect the diverse histories and
>
    cultures of the Beothuk, Mi'kmaq, Innu, and Inuit of this province.
>
```

>

JANET BRUNTON, PhD Professor and Deputy Head (Undergraduate) Department of Biochemistry Memorial University of Newfoundland St. John's, NL A1C 5S7 709 864-8533

HUMAN KINETICS and RECREATION Feedback

------ Original message ------From: "Power, Kevin" <<u>kevinp@mun.ca</u>> Date: 2022-11-09 2:29 p.m. (GMT-03:30) To: <u>jbrunton@mun.ca</u> Cc: Kevin Power <<u>kevin.power@mun.ca</u>> Subject: New Program Consultation

Hi Janet,

Our Faculty met and discussed the proposed HUBI program. Please see our feedback below. Should you have any questions, please reach out to me directly.

The Faculty in the School of Human Kinetics and Recreation have reviewed the proposal for a new undergraduate degree in Human Biosciences and have raised a number of concerns. The biggest issue relates to terminology and apparent overlap with the degree programs we offer.

- 1. A number of Faculty members voiced strong concern and opposition to the name of the degree program. Human Biosciences, from our perspective, could be interpreted as covering anything and everything related to the biological sciences of humans. This includes knowledge relating to some of our core subject matter such as systems physiology, anatomy, motor control and biomechanics, to name a few.
- 2. In the rationale it states that:
 - a. 15 of 16 current faculty members have funded research programs with a human health focus. While we applaud the faculty for their scientific efforts, human health is a main focus of our degree programs.
 - b. A more student-centric focus as a main feature. Again, we applaud this effort, however the development of interdisciplinary programs including pre-health care options is also a main focus of our School. Many of our students go on to additional educational programs such as physiotherapy, occupational therapy or medicine.
 - c. A focus on the application of concepts to human health and disease is also very much a main focus of our degree programs.
- 3. It is stated in the original email dated October 20 that "We are in the process of setting up meetings with Academic Units that will be impacted by the new program and new course codes." Have other schools/faculties been contacted? We look forward to discussing any and all of the above issues stated.
- 4. There are other potential issues that would need to be discussed relating to course number changes that could impact some of our students given they currently take BIOC 2600. Would our students still receive priority access?

Regards,

Kevin

KEVIN POWER, Ph.D. | PROFESSOR | CSEP-CEP®

Acting Associate Dean of Undergraduate Studies School of Human Kinetics and Recreation / Cross-Appointment, Biomedical Sciences, Faculty of Medicine Memorial University of Newfoundland St. John's, Newfoundland | A1C 5S7 Physical Education Building | Room PE 2022A (T) 709 864 7275 | (F) 709 864 3979 WebEx Personal Meeting Room: https://mun.webex.com/meet/kevinp

Department Responses

From: Janet Brunton <<u>ibrunton@mun.ca</u>>
Date: Wednesday, November 9, 2022 at 4:13 PM
To: "Power, Kevin" <<u>kevinp@mun.ca</u>>
Cc: Kevin Power <<u>kevin.power@mun.ca</u>>, "Berry, Mark" <<u>mberry@mun.ca</u>>, Valerie Booth
<<u>vbooth@mun.ca</u>>
Subject: RE: New Program Consultation

Hi Kevin

I apologize for not reaching out for a meeting with HKR. With a weeks' notice, i was offered joint replacement surgery, so i am off on leave now. Our Head, Mark Berry and our previous Deputy Head Valerie Booth will be in touch to discuss your concerns.

I think the primary impact on your program is changes to Bioc 2600, which is pretty much just a new course number. For sure your students will still get priority admission to the course. We are actually moving to delivering the course in Fall and Winter semesters because it has grown substantially in registration numbers. Hopefully this will provide more flexibility for students in your programs as well.

Mark and/or Valerie will follow up with you soon.

Regards,

Janet

Sent from my Bell Samsung device over Canada's largest network.

Hi Kevin

Thanks for the response to our CITL-facilitated program proposal, which was led by a Biosciences specialist from within CITL. We have carefully considered the points raised and offer the following responses.

 Human Biosciences could certainly be regarded as a broad name, which is why there are sub-concentrations specified. That is hardly unusual in degree programs, either in Canada or worldwide. The following has been added to the beginning of the calendar entry to provide further clarity of the specific areas that are covered by this program

"How do food, drugs and the environment impact your health? That is the central question of the Human Biosciences program. Introductory courses provide the necessary background in an interdisciplinary manner with each course blending concepts from biochemistry, nutrition, pharmacology, and toxicology. Students may tailor their program to their own interests through diverse electives leading to one of our pre-defined sub-specialties (Human Biosciences [Biochemistry], Human Biosciences [Nutrition], Human Biosciences [Health and Disease], Human Biosciences [Gene Regulation]), or a student-defined general Human Biosciences degree. Honours degree options involve completion of a research project that may focus on either laboratory-based research, a literature-based systematic/scoping review, education/outreach, or entrepreneurship/business projects, depending on student interests and career goals."

As I am sure you noticed, the only aspects of Physiology and Anatomy that are covered in our proposal are those in the introductory Biology courses (Biol 1001 and 1002) and more meaningfully in the Med 310A/B course, concepts and requirements that have been mandatory components of all our department programming (and other department programmes) for decades. There is zero motor control or biomechanics content. It is probably worth re-emphasizing that this is not a new area that we are "moving in to". This proposal has grown out of a re-packaging, merging, and modernization of existing offerings and programs in the Department. Comparing the calendar entries and course descriptions for our proposal and the HKR program clearly show very different foci with no overlap.

2. We are really not sure what point is trying to be made in the three sub-points. Are HKR suggesting that there is room for cross-listing courses and exploring synergies to provide further inter-disciplinary options to students? That is something we would certainly welcome and would be happy to discuss about incorporating in to the senior years of our programming which is scheduled to begin phasing in for the 2024/25, so lots of time to iron out those specifics. They could even be an option for subsequent development of an additional sub-specialization. A major part of our renewal and modernization has been to examine pre-requisites, ensure these are justified, and where possible remove needlessly onerous pre-requisites to make courses more accessible as elective offerings for students in other programmes. We would certainly be interested in including HKR courses as elective offerings if pre-requisites are not overly restrictive.

Or are HKR suggesting that in someway they are the only unit that should have human health, interdisciplinarity, and application of concepts to health and disease as part of

undergraduate programming? In which case we respectfully strongly disagree on the following grounds...

- a. "Human health is a central component of HKR programming." As stated above, the current proposal is based on a re-packaging, merging, and modernization of existing programming in the department and reflective of modern-day blurring and expansion of traditional disciplinary boundaries. The human health and disease focus and content of this proposal is not new, merely an evolution of many decades of existing Biochemistry and Nutrition programming. Psychology and Behavioural Neuroscience are other long-standing existing programmes in Science that focus on Human health and Disease. We do note that Medicine, Pharmacy, and Psychology, 3 programs de facto focussed on human health, have all submitted written feedback expressing strong support for our proposal and zero concerns that the name is in someway infringing unit territoriality.
- "Development of interdisciplinary programming is a main focus of our school." b. The Faculty of Science strategic plan, that has been accepted by Dr. Timmons (and the previous Provost), explicitly states that pre-health care interdisciplinary programming is a strategic focus and area for future programming growth in the Faculty of Science. This is clearly stated in our rationale. Further, it is also clearly stated in the rationale that this program is designed to better serve existing students that already come through the department. It is not a program designed with the intent to recruit additional students. Many of our graduates also go on to professional schools – Pharmacy, Medicine, Nursing, Education -, health related graduate programs, health related industry and government positions, and indeed have formed highly successful health-related companies (eg. Nucliq Biologics, PolyUnity Tech Inc.). Indeed the Faculty of Business are also enthusiastic about this proposal to the point that they are in late stage planning with us about using this program as a basis for a joint undergraduate program between Science and Business.
- c. "A focus on the application of concepts to human health and disease is also very much a focus of our degree programs." Basically see responses to a and b above. We are unaware, based on a thorough examination of calendar entries, of any HKR programming that covers Biochemistry, Nutrition, Pharmacology, or Toxicology, the "disciplinary" components clearly identified in the rationale as the central over-riding foundations of this program proposal. We are unable to find any evidence that this duplicates or is redundant with, anything that is in HKR programming. Indeed, the Sports Nutrition course that has been part of our existing programming for very many years, and would be the most obvious Human Kinetics and Recreation "territory" is not included in HKR programming, and only averages 1-2 HKR students per year. Empirical evidence simply does not support a claim of any level of overlap, duplication, or redundancy.
- 3. We apologize for the delay in offering a direct meeting. With Janet's impending surgery we felt we needed to prioritize the units whose students were the highest users of our existing programs Pharmacy, Biology, Chemistry and most likely to be affected due to the changes in the Metabolism and Immunology programming. All other courses that are cross-listed with other units are simply a change in our departments numbering, with zero impact, although we will happily incorporate secondary calendar changes if such units wish to match our change in numbering.

4. There is no change to Bioc2600, other than a number change to reflect the new programming and establish a logical numbering system that will be easier for students to understand. There will be no impact whatsoever on the ability of HKR students to enroll in this course. Indeed we have started offering this course in two semesters because of the continually increasing enrollments to ensure that it remains available. As indicated above, we can easily incorporate a secondary calendar change if you would like to match the change in numbering from 2600 to 2002, although you may already have 2002 numbered HKR course and so are also fine if HKR wishes to retain the cross listing as HKR2600.

We hope this clarifies any confusions there may have been amongst HKR faculty.

All the best

Mark

MEDICINE Feedback

From: "DeanofMedicine@med.mun.ca" <DeanofMedicine@med.mun.ca> Date: Monday, November 7, 2022 at 11:33 AM To: "Berry, Mark" <<u>mberry@mun.ca</u>> Cc: "<u>mgrant@mun.ca</u>" <<u>mgrant@mun.ca</u>>, "<u>bwilson@mun.ca</u>" <<u>bwilson@mun.ca</u>>, medvicedean <<u>medvicedean@mun.ca</u>> Subject: human biochemistry Hi Mark

We have reviewed the new human biochemistry curriculum.

I have just reviewed the changes to the Biochemistry program. We think it is a solid curriculum for those considering a health professions career. It appears that you have added a few things and changed the terminology (adding interdisciplinary and indigenous focus). I just wondered if you will have guest lecturers from clinical faculty\clinicians.

I think one area which may need further discussion is we need to where nutrition and dietetics education is now going in Canada. Brenda Wilson would be happy to have a conversation with you to discuss this area with you. I think at our next meeting to discuss the environmental scan of other programs in a Bachelor of Medical Clinical Sciences it would also be helpful to discuss other opportunities.

I hope this feedback is helpful.

Congratulations on the revision of your program. Cheers Margaret

Department Responses

From: Berry, Mark [mailto:mberry@mun.ca]
Sent: Monday, November 7, 2022 11:47 AM
To: Steele, Dr. Margaret: Dean of Medicine <<u>DeanofMedicine@med.mun.ca</u>>
Cc: Grant, Michael <<u>mgrant@mun.ca</u>>; Wilson, Brenda <<u>bwilson@mun.ca</u>>; medvicedean
<<u>medvicedean@mun.ca</u>>; Janet Brunton <<u>jbrunton@mun.ca</u>>; Booth, Valerie <<u>vbooth@mun.ca</u>>
Subject: Re: human biochemistry

Thanks Margaret

We have already started incorporating guest lectures in some of our courses as applicable, for instance we had a panel discussion session in Bioc1600 (will become HuBi1001) with experts from the Nutrition industry, Pharma industry, and someone who received an MBE for services to development of halal-compatible cosmetics, but yes it is something we are very much planning to incorporate.

The Nutrition aspect of this will remain very heavily molecular focus as our current Nutrition program is. It's something that is unique (I believe Guelph is the only other program that has a Nutrition aspect more focussed on molecular rather than clinical) and my information from Rob Bertolo, Janet Brunton, and Sukhinder Cheema, who have all served (or are serving) executive positions (including President) of the Canadian Nutrition Society, this is something that is highly valued in the Nutrition community. The dietetics aspect is something that would be a discussion with Acadia. That is run out of the Dean of Science office here, and it is something that we as a department are neither interested, nor have the resources, to take back on. That said we are happy to chat about how this new program could fit in any future iterations of dietetics.

Thanks

Mark

Thanks Mark for answering my question so quickly. Also thanks for your openness to discussing nutrition with Brenda Cheers Margaret

MARGARET STEELE | DEAN OF MEDICINE

Faculty of Medicine Memorial University of Newfoundland Faculty of Medicine Building | Room M2M311 300 Prince Philip Drive St. John's, NL, Canada A1B 3V6 T 709 864 6324 | F 709 864 6336 www.med.mun.ca/

Vision: Through excellence, we will integrate education, research and social accountability to advance the health of the people and communities we serve.

Destination Excellence: Faculty of Medicine Strategic Plan 2018-2023

Follow us: Facebook <u>www.facebook.com/MUNMedicine</u> | Twitter <u>www.twitter.com/MUNMed</u>

SCHOOL of SCIENCE and ENVIRONMENT (Grenfell) Feedback

------ Original message ------From: "Sveshnikov, Dmitry" <<u>dmitry.sveshnikov@grenfell.mun.ca</u>> Date: 2022-11-06 9:45 p.m. (GMT-03:30) To: jbrunton@mun.ca Cc: Dean - School of Science and the Environment <<u>ssedean@grenfell.mun.ca</u>> Subject: RE: New Program Consultation

Good afternoon,

The School of Science and the Environment (Grenfell) Committee on Academic Programming has reviewed the materials for the following calendar change proposal:

• New undergraduate program in Human Biosciences

The Committee has no comments or concerns.

Thank you,

Dmitry Sveshnikov (Chair of SSE-CAP)

Dmitry Sveshnikov, Associate Professor

Environmental Science / Biology

School of Science and the Environment

Grenfell Campus Memorial University of Newfoundland

20 University Drive, Corner Brook

Newfoundland, Canada, A2H 5G4

Office: AS213

Phone: +1(709)639-6528 (leave a message)

Email: <u>dmitry.sveshnikov@grenfell.mun.ca</u>

BIOLOGY Feedback

From: Yolanda Wiersma

November 2, 2022

Hi Janet,

BUGS discussed your unit's proposal this week and I am in the midst of writing up a summary. We are impressed with what you've put together.

We also just circulated it to the department as there are a few non-BUGS folk who will have useful input.

A few notes below yours, and some quick questions here...

1. How tied is your unit to the proposed name? We feel like "Bioscience" could be equated to "Biology" and so it almost sounds like Biochemistry is becoming "Human Biology" and we are "Biology of everything else" (plants, bacteria, non-human animals, fungi)".

2. Did you compare your streams/concentrations to ours? Two have very similar names – to two of ours, but quite different courses on the "a la carte" menu that students can choose from, which seems a little odd/confusing.

Thanks,

Yolanda

From: Janet Brunton <jbrunton@mun.ca> Sent: Wednesday, November 2, 2022 2:41 PM To: Wiersma, Yolanda <ywiersma@mun.ca> Subject: New Progam Questions

Hi Yolanda,

I wanted to give you a heads up that we intend to send our new program proposal to FoSCUGS for the next meeting, which will likely happen around the in the third week of November. Mark Berry (and perhaps Valerie Booth) will be taking the lead on presenting it, because I'm going on medical leave starting next week (poor timing for sure....).

There are a couple of things that I wanted to bring to Biology's attention sooner rather than later, to try to make the review process smoother.

 As you are aware, we are creating a new 2nd level metabolism course (HUBI 2003 Basics of Human Metabolism); we are keeping Bioc 3206 on the books until the current cohort of students in Biochem are through the program, and then it will not be offered. We also have proposed to develop a 4th year advanced metabolism course that will be more regulation of metabolism, and will be an elective in our program. In the proposed secondary calendar changes, I think we substituted HUBI 2003 for Bioc 3206 in the Biology program - but of course this decision is completely up to your academic unit.

Yes, we're aware that HUBI 2003 is replacing BIOC 3206. We are debating keeping HUBI 2003 in our program, or only recommending it for students who are interested in advanced physiology courses. We need to consult with our physiology folks to see how critical they think HUBI 2003 is. But I think the sentiment is to leave it out of the program as it is only a PR for 3 of our courses.

2. Another change we have made to our program is in our 2nd year molecular biology-focused course (BIOC 2200), which is becoming "HUBI 2004 (see proposed calendar entries below). It is shifted in content away from genetics, so much so that the architects of the course don't think credit restriction with BIOL 2250 is necessary (as is the case with BIOC 2200). For many courses, BIOC 2200 or BIOL 2250 were considered interchangeable prerequisites, so this change may have impact on your program as well.

We had quite a bit of comment on that course, but I left my notes at work. I will get back to you asap.

I think Mark Berry has suggested a meeting with him, you and Andrew Lang and I. I guess if you are away it will be Valerie.

Please let me know (preferably soon!) if you have any questions.

Thanks very much,

Janet

HUBI 2004 Fundamentals of Modern Molecular Biology

will introduce the mechanisms by which genomic information is stored, and expressed; and how expression is regulated. Topics will include nucleic acid structures, DNA replication, RNA transcription and splicing, and how proteins are synthesised. Molecular biological techniques, their applications to biotechnology used in the advancement of food and drug development, and the implications for modern living will be discussed.

CR: Biochemistry 2100, 2200

PR: Biology 1001

2100 Introduction to Molecular Biology and Genetics will cover the heritability of simple traits from phenotype to genotype; the discovery of DNA as the molecule of

heredity; the structure and function of DNA; the elucidation of the genetic code; and the manipulation of DNA for recombinant DNA technology and biotechnology.

Department Response

From: Janet Brunton <jbrunton@mun.ca> Sent: Wednesday, November 4, 2022 5:23 PM To: Wiersma, Yolanda <ywiersma@mun.ca> Subject: Re: New Progam Questions

Thanks Yolanda - for your quick (preliminary) feedback.

Regarding the program name, we discussed it a number of times (many, many times!) during our curriculum review and program development sessions, and honestly this was favoured option that we felt represented us the best while being the least controversial when considered by other academic units. All of our research-active faculty members are focused on some aspect of human health research, so everyone felt strongly that this aspect should be represented in our program name. As for "biosciences", the interdisciplinary nature of our new program isn't accurately described by "Biochemistry", because it includes biochemistry, nutrition, pharmacology and (human) toxicology (not environmental). Biosciences is generic enough to cover everyone involved; we purposefully avoided "Biological Sciences" to avoid confusion with Biology. So I would say we are quite committed to the program name -but we are certainly open to suggestions! We have added a program description (reproduced below) into our calendar entry for the new program, which we hope will clarify the scope of the program.

As for the concentrations, we agree that we should come up with another more descriptive name for our "Molecular Biology" concentration, and are working on it. I presume the others with similar names you are referring to are "Health and Disease" and Biology's "Health Professionals". As you noted, they have very different baskets of courses to choose from - so there is no question that they are very different programs. Is Biology suggesting that we should avoid the word "Health" because Biology has used it? I think the inclusion of "Professionals" in Biology's concentration is enough to avoid any confusion, and clearly suggests that it is intended a pre-professional stream, which is not an objective of the new Health and Disease Concentration.

It would be great if you have a meeting with Mark and Valerie sometime soon, especially to discuss Biol 2250 and HUBI 2004.

Thanks again for your input.

All the Best, Janet

BIOLOGY Feedback 2

Hi Mark, Valerie,

In follow up to our meeting, here is a written document summarizing feedback on the Biochemistry program proposal. Note that our major concern/comment is about the name of the program; overall we support the changes, the bulk of the comments are meant as constructive suggestions.

Best,

--

Yolanda

Dr. Yolanda F. Wiersma, PhD (she/her) Professor and Deputy Head (Undergraduate)

I support my union's efforts to achieve a fair deal. We are MUNFA!

Department of Biology Memorial University of Newfoundland and Labrador St. John's, NL, Canada

Ph. 709.864.7499 Cell. 709.986.8543

https://nllandscapeecology.com/

Please note: the full report from Biology complete with Tables and supporting documentation can be found at this link.

Report from Department of Biology re: Consultation on proposed undergraduate calendar change proposal from Department of Biochemistry (revised program title: BSc in Human Biosciences)

Thank you for the opportunity to provide feedback on the proposed Program change. We are impressed by the collective effort your department put in to critically reviewing your program, and revising it to consider skills and competencies as per your AUP.

We are curious if the goal here is to essentially re-cast Biochemistry as a "Pre-Med" program. This is obviously strategic in terms of recruiting students with aspirations for Medical School, but on the other hand, it has the potential to be limiting. If this is the underlying current, it should be acknowledged that any medical/health focus in this program is strictly limited to health at the level of biomolecules and cells.

We have grouped our comments under four headings:

- 1. Program title
- 2. Program regulations
- 3. Concentrations
- 4. Specific courses

1. Program title

We have serious concerns about the use of the term "Biosciences" in your program name. We know that you put a great deal of careful thought in the program name, but we are concerned with overlap with our department name. We feel the proposed name will be confusing to prospective and current students. Put simply, "bioscience" is the same as "Biology". The Merriam- Webster online dictionary defines "Bioscience" as "Biology" (Figure 1).

Moreover, if we use journal titles, aims and scope as a guide to defining a field of study, a close look at the web page for *BioScience* (published by Oxford Academic for the American Institute of Biological Sciences) is instructive. On the "About page" (screenshot in Figure 2), it states "Since 1964, *BioScience* has presented readers with timely and authoritative overviews of current research in biology, accompanied by essays and discussion sections on education, public policy, history, and the conceptual underpinnings of the biological sciences." Note there is no mention in the Aims and Scope of biochemistry, or the "foundational biochemical, nutrition and molecular concepts" which are the concepts outlined in this program proposal. A keyword search for these three terms within the journal *BioScience* yields very few hits (see Table 1, and Appendices A1-A3). With regards to the concept of biochemistry, only 1 of these papers 2

appears to be aligned with the topics outlined in this proposal; a very dated paper on neurotransmitter release (Van Der Kloot and Kita 1974). There are a few more papers in *BioScience* related to nutrition;

however one of these is related to research in archaeology (Larsen et al. 2022), and others to sustainable food systems (i.e., environmental science, e.g., Schipanski et al. 2016; Nogeire-McRae et al. 2018) or landscape ecology (e.g., Gergel et al. 2020). The one nutrition paper that appears more aligned with molecular-level work in the journal *BioScience* is focused on animal nutrition (McCue 2011). There are 60 papers in *BioScience* with "molecular*" in the title, abstract or keywords, but only a handful appear to have a human focus (Ben-Ari 1999; Phillips 2008; Stone 2012; Farrell et al. 2021); the majority focus on non-human organisms (e.g., bacteria, crop plants, animals).

While the argument might be that by placing the adjective "Human" in front of the program name, the program/department are distinguishing themselves from other units at the university, we would argue that "Human Biosciences" as a title is just as misleading for potential and current students, as well as employers and post-grad programs looking at the student's degree name. A comprehensive program in human biosciences would include biological work above the level of the cell, including histology (currently taught in our unit), bio-locomotion (work done here at Memorial in the School of Human Kinetics), neurological and mental health dimensions (covered by our Psychology Department) and work on human-environment interactions. For example, the University of Toronto has a "Human Biology" program, which includes four areas of study (Fundamental Genetics and its Applications; Global Health; Health & Disease; Neuroscience). Their program includes courses that are not included in this proposal, including courses in histology and histopathology, global health issues, neurobiology, and exercise physiology. Thus, a program called "Human Biosciences" — while no doubt an appealing program name for students—should be more comprehensive than what is proposed here, and consider more than human cellular and sub-cellular systems. Similarly, the University of Guelph has a Department of Human Health and Nutritional Science, which includes courses in physiology, anatomy and pathology; topics not included in the current proposal.

Given the specific focus in your unit on cellular and sub-cellular processes of human systems, we find it hard to see how this program can claim to be "interdisciplinary" – it does not touch on other scientific disciplines, nor does it interact across other disciplinary boundaries such as the social sciences and humanities. Moreover, there is overlap conceptually with human dimensions of biology in other units (Psych, HKR, Biology) – for example our BIOL 3295 Population Ecology and Evolution cover human population dynamics, demography and infectious disease spread. Down the line, an interdisciplinary program in Human Biology that spanned your unit, Biology, HKR, Psychology and Medicine (among others) would be an amazing program to offer our students. 3

2. Program regulations

We have some concerns with the Admission to the Major requirement 11.X.1.1, item 1e, which states BIOL 1002 or Human Biosciences 1001 (or Biochemistry 1600). Because BSc students at Memorial do not declare a Major until completion of first year, and given that all of Biology's second-year courses require both BIOL 1001 AND BIOL 1002, we are concerned that first year students who opt to take HUBI 1001 (which does not have a lab) over BIOL 1002 (which has a lab) will have limited options in year 2 should they elect to do a Biology Major. If there are good pedagogical reasons for not including BIOL 1002 as a PR for your second year courses, then communication with applying and first-year students about the implications of taking HUBI 1001 over BIOL 1002 need to be clearly communicated. The above concern about BIOL 1002 vs HUBI 1001 also applies to the following:

2 11.x.2.1 (Major in Human Biosciences 1.b)

11.x.2.2 (Honours Degree in Human Biosciences) 1.b.

We are curious about the statement "Students who have appropriate high school equivalent courses would be admitted directly into the Human Biosciences major". What kind of high school equivalency courses would be needed for direct entry?

Some minor suggestions in the program regulations for the Human Biosciences and Cell Biology Joint Honours (section 10.2.3 in the proposal).

Item8 – we suggest you remove BIOL 4251 (Genomics) as the Biology department is not longer able to offer this

Item 8 – we suggest you remove BIOL 4251 (Evolutionary Genetics); this course is not appropriate for Human Biosciences as it does not have a human focus.

3. Concentrations

Two of the proposed concentrations, 11.x.x.2 Health and Disease and 11.x.x.3 Molecular Biology are extremely similar sounding to two of Biology's concentrations, Biology for Health Professionals and Molecular, Microbial and Cell Biology. Yet between the two departments, the list of possible courses to select from for the concentration is quite different, as is the number of credit hours (15 credit hours for the concentrations in Human Biosciences, and 18 credit hours for the concentrations in Biology). Given the close alignment of the two departments, we feel that the number of courses for a concentration should be equivalent between the Departments of Biology and the Department of Biochemistry/Human Biosciences. 4

We compared the course listings between the two departments for Molecular Biology in Table 2a and for the Health concentrations in Table 2b. Only two courses overlap in the Heath concentration and only four (of 15 and 9 possible in Biology and Human Biosciences respectively) in the Molecular Biology stream. This seems to be fairly minimal overlap, suggesting that they may be quite different concentrations (students taking a concentration within the Biology program will have a very different experience from students taking a similar concentration within the Human Biosciences program) and should probably be renamed. As well, some of the Biology courses listed under the Human Biosciences concentration are not particularly human-focused (some, like BIOL 4250 Evolutionary Genetics do not discuss human aspects at all), and thus may not fit well within a Human Biosciences program. On the other hand, BIOL 3050 (Microbiology) might be a strategic fit for the concentration in Health and Disease.

4. Specific courses

We appreciate the introduction of a 2nd-year level Metabolism course—the new HUBI 2003—to replace the former Biochemistry 3206. We anticipate making HUBI 2003 the pre-requisite for our courses that formerly listed Biochemistry 3206 as a PR (3 courses in BIOL total); we are contemplating dropping Metabolism as a requirement for all Majors, but have not made a decision on this yet and plan to let the new course run for a few years before making a decision.

We only have comments on the following courses:

HUBI 2004 Fundamentals of Modern Molecular Biology

The two courses that this replaces (Biochemistry 2100 and 2200) were ones that historically had a high degree of overlap with two of our courses (BIOL 2250 – Principles of Genetics and BIOL 2060 Principles of Cell Biology). Our assessment of the new slate of courses proposals is that there is less overlap than previously.

We looked over the proposed syllabus carefully with faculty in our unit who have taught BIOL 2250 and 2060. The overall assessment is that the proposed HUBI 2004 is potentially more advanced than BIOL 2250 (i.e., it focuses more on topics in the second half of the text book), yet easier to get into (HUBI 2004 requires only BIOL 1001/1002; BIOL 2250 requires both BIOL 1001, and 1002 plus Chemistry 1050. The topics proposed in weeks 1-3 of HUBI 2004 overlap with the topics in BIOL 2250, but essentially, our faculty felt they are two distinct courses, which is great and does solve quite a bit of the previous issues with overlap between BIOL 2250 and Biochemistry 2100 and 2200. A number of the topics in HUBI 2004 (weeks 4-5, 9, 10 are touched on in BIOL 2250, but not in depth. Several topics in HUBI 2004 (weeks 1-2, 4, 7 and 9) overlap with topic taught in BIOL 2060, so perhaps we still have issues of overlap/duplication there.

We do have two small queries/suggestions for wording of the calendar description... 5

Should it read "heritability of simple traits from genotype to phenotype"? We suggest replacing "simple traits" with "biochemical traits.

HUBI 3004 Cellular Signalling

It was suggested to add BIOL 2060 (Principles of Cell Biology) to the pre-requisites for this course.

HUBI 3005 Environment-Health Interactions

We suggest rethinking the course title. The course appears to be mainly about food issues (allergens, additives, etc.) and effects on cellular-homeostasis, which is quite a bit narrower than "environment" and "health" which could include things like air quality and respiratory diseases, built environments and physical and mental health, soils/water quality and disease, etc.

Paper 5.A.y. (pages 197-349)

From: Biochemistry Head <<u>biochead@mun.ca</u>>
Sent: Friday, November 18, 2022 4:18 PM
To: Wiersma, Yolanda <<u>ywiersma@mun.ca</u>>; Booth, Valerie <<u>vbooth@mun.ca</u>>; Janet Brunton
<<u>jbrunton@mun.ca</u>>
Cc: biologyhead <<u>biology.head@mun.ca</u>>
Subject: Re: Consultation on Biochemistry

Hi Yolanda

Thanks for your detailed feedback. While we feel we must agree to disagree on some aspects, most notably the meaning of the word Bioscience, we appreciate your comments and are happy to incorporate the majority of them in to an updated proposal. Our detailed response to your feedback is attached.

All the best

Mark

Hi Yolanda

Thank you for your detailed follow-up submission. While we respectfully disagree about some points raised, we very much appreciate the time that the Biology department has devoted to thoroughly reviewing our proposal, and both welcome and accept many of your suggestions. We address the comments raised, in order, below.

1. There is no intent whatsoever to 're-cast Biochemistry as a "pre-med" program'. There is no such thing at MUN. The medicine program accepts applicants from any background, including routine acceptance of students from disciplines as different from "pre-med" as Music. The term pre-med is simply a misnomer. As stated in our rationale, the sole driving force of the proposal is merger and modernization of our existing programming within the department based on a CITL-led pedagogical assessment, recognizing the expansion and blurring of those traditional disciplinary boundaries, while also taking advantage of the expertise of recent hires that have extended the departmental competencies into the related and over-lapping discipline of Pharmacology and Toxicology. The program description that we have added in response to your initial feedback specifies that the program will focus on food, drugs and environmental influences on human health. While at a reductionist level these all have a molecular and cellular basis, Biochemistry, Nutrition, Pharmacology and Toxicology, however, are not merely restricted to interactions at that level. How those molecular and cellular effects impact organ, tissue, and even whole body functioning are also key areas. Indeed if you look at our identified foundational pillars three of the 12 (Human Physiology and Cellular Biology; Cell to Whole Body Experiential Laboratory; Human-Environment interactions) are clearly not restricted to the molecular/cellular level. A quick look at the educational resources offered by the Canadian Nutrition Society reveals a diverse array of topics spanning molecular, cellular, organismal, mental health, and environmental. These are all included in our foundational pillars, core concepts, and interspersed throughout the revamped programming.

We respectfully, but strongly, disagree with the characterization of Biosciences as being the same as, and solely limited to, the traditional discipline of Biology. Other dictionary definitions include

"any of the areas of scientific study that relate to living things" (Cambridge University Press), synonym of "Life Sciences" (also Cambridge University Press), "another name for a life science" (Collins dictionary); "a biological science" (Oxford English Dictionary). The definition you have provided indeed indicates "also Life Sciences". We obviously agree that Biology is one of the Biosciences, but to try to categorize it as the only Bioscience is simply factually incorrect. In support of our position, we offer the following. A primary mandate of the Biochemical Society is to "advance molecular bioscience" and "champion molecular biosciences"; the Canadian professional society for Biochemistry researchers is the Canadian Society for Molecular Biosciences, which itself is a member of the International Union of Biochemistry and Molecular Biology, and one of whose official journals is "Biochemistry and Cell Biology"; the official journal of the Canadian Nutrition Society focusses on "application of physiology, nutrition, and metabolism to the study of human health...of interest to...basic and applied physiologists, nutritionists and biochemists" (see also the diverse topics covered in the Canadian Nutrition Society educational resources); the Canadian Society of Pharmacology and Therapeutics defines pharmacology as "the study of the mechanism of action of factors that impact their effects on biological systems". Biosciences clearly embodies far more than traditional biology programming.

We have identified a multitude of Human Biosciences undergraduate programs, and there is simply no single standard template. Some focus on "enhance your understanding of how the human body functions in health and disease at the tissue, cell, and molecular level" (Coventry University); "study include human physiology, cell and molecular sciences, neuroscience, how drug treatments work..." (Manchester Metropolitan University); "understanding of the human body at the level of the organs, tissues, cells, and molecules... investigate both how the body works and the consequences when physiological processes go wrong" (University of Northampton); all very similar to our proposal; "a broad range of bioscience disciplines underpinned by a biomolecular knowledge-base" (Plymouth University) with many of the individual modules there overlapping with course content of our proposal; others, however, focus on "health, physical activity and cell biology..." (Exeter University). Indeed the program at the University of Northampton is remarkably similar in style to the one we have proposed - "The Human Biosciences Programme is divided into three stages. The first stage provides an introduction to the core disciplines [emphasis added, note plural of discipline] which underpin academic analysis and communication of bioscience. In stages Two and Three, students can select modules from a range of modules which allows students to subtly tailor studies towards a particular area of interest within the broader discipline". Notwithstanding the multitude of "flavours" that are clearly present in Human Biosciences programs, all are accredited by the Royal Society for Biology, an organization that also accredits Biochemistry, (Bio)Medical Science, Healthcare Science, Pharmacology, Neuroscience, Human Physiology, Anatomy, Biotechnology, Biomolecular Sciences, and Immunology programs, as well as the various iterations and sub-divisions of Biology programming. In almost all instances, multiple of these programs are accredited at an individual institution. "Biosciences: an overview of undergraduate studies in the UK" a comprehensive study undertaken by the Centre for Higher Education Research and Information at the Open University and the Centre for Research in Lifelong Learning of the University of Stirling identifies 21 different disciplines that comprise biosciences including Biochemistry, Pharmacology, and Food Science. Clearly, the "Biosciences" field expands far beyond Biology, even when limited to Human, and there are very many "flavours" of such programs that can happily co-exist within a single institution and are accredited by the learned societies. We also note that in the Times Good University Guide of 2021, the Human Biosciences program at Coventry University was ranked number 1 for career prospects. Clearly the term Human Biosciences alone has abundant meaning to global employers, and our concentration designations will provide further clarity of the "flavour" chosen by individual graduates.

We do not agree that human physiology, anatomy and pathology are not covered in our proposal in particular given that Med 310A/B "Human Physiology" is a mandatory requirement of the program. Indeed this is a major distinguisher from the Biology programming at MUN that does not require any Human Physiology course, although we accept Med310A/B is an optional elective course in one of Biology's concentrations.

We do also note that the Cancer and Development graduate program in the Faculty of Medicine at MUN is changing name to Bioscience of Health and Disease, and that the Faculty of Medicine have expressed strong support for our undergraduate proposal with no reservations about the proposed name, despite the clear and obvious similarities in program names, albeit at different stages of student training.

As stated in the proposal rationale our program is designed to not only span the traditional disciplinary boundaries of Biochemistry, Nutrition, Pharmacology and Toxicology, but has restructured content to incorporate the concepts from those traditionally separate disciplines into individual courses. We believe this is completely consistent with the term interdisciplinary. We would certainly more than welcome discussions with Biology about future interdisciplinary programming options that can be delivered jointly by the two departments. Indeed on the basis of the current proposal we have already entered in to late stage discussions with Business Administration about new combined programming, and other units in the Faculty of Science have expressed interest in developing new joint programming with a Human Biosciences program.

2. Based on our previous meeting with you, we have amended our advice sheet to indicate that students who are unsure of their degree interests who have not taken BIOL1002 in first year should take the course in the Fall semester of their second year. As you intimate, many students simply do not know where their interests lie when they enter University, having only been exposed to traditional Chemistry, Biology, Physics, and Math content in High School, and it is not until they sample different disciplines that they are able to make an informed decision. We are acutely aware that requiring both HuBi1001 and Biol1002 would make first year programming overly restrictive for students. While based on the provided course outline (see below) pedagogically we could not justify making biol1002 a requirement, HuBi1001 matching far better to our concept mapping, we accept that the Biol1002 course serves a useful purpose in providing evidence that students have an aptitude for studying biological systems. Therefore, to provide flexibility for students we are willing to accept that biol1002 can substitute for Hubi1001 in demonstrating capacity for potential success in a Human Biosciences program, essentially providing 2 pathways to program entry. Over the past several years we have established a process to track student performance as a function of prerequisite completion, particularly in our introductory courses. Indeed, this has informed some of our proposed changes to pre-requisites in the new program. We will be continuing to track student outcomes in the new program, and should it become apparent that one pathway is more advantageous than the other, we will obviously implement the necessary changes to program entry requirements.

We conducted a thorough concept mapping exercise as part of our curriculum review, based on course outlines provided by the departments of record, in order to critically assess the existing pre-requisites. Based on that we are proposing that the pre-requisites for HuBi2001 (formerly Bioc2201)

be amended to require Biol1001. In their current form there is no biology pre-requisite required for any Biochemistry or Nutrition course or programming. On this basis, it is unclear to us how now incorporating biology requirements into our programming is going to somehow prevent students from having access to second year Biology courses.

Thank you for the clarification on Biol4250 and Biol4251 content. Based on this information we have removed those as options for our re-named (see below) Gene Regulation concentration.

3. As we discussed in our meeting we are willing to accept that our originally named "Molecular Biology" concentration could be confused with Biology's "Molecular, Microbial, and Cellular Biology" and have renamed our concentration "Gene Regulation". We do not, however, agree that our "Health and Disease" concentration is confusing with "Biology for Health Professionals". As described above, none of our programming is designed to be "pre med" or "pre health care" or any new cohort of students byond those that our programs currently serve, and we are happy for students interested in "pre health care" programming to gravitate to the Biology option. Again, the proposal is merely a repackaging and modernizing of existing content, and directed at improving the programming and outcomes of students who traditionally have followed either a Biochemistry or Nutrition pathway.

We are unaware of any stipulation for programs offering concentrations to require a set number of credit hours from a concentration. Our two departments have a long history of having very different pedagogical approaches – almost every Biology course has a laboratory component to it, we have only 120 laboratory contact hours and dedicated lab courses (rather than lecture-lab combinations). We do not feel that the HuBi program requiring 15 credit hours from its concentrations is in any way incompatible with Biology requiring 18. They are different degrees with different pedagogical approaches.

We appreciate the suggestion with respect to Biol₃₀₅₀, and have added this to our Health and Disease concentration.

4. We are happy to hear that Biology appreciates our re-focusing of the former Bioc3206 course, and the updating of Bioc2200. We agree that the HuBi2004 course and Biol2250 are now very distinct and do not warrant credit restriction. We understand the comment about the level at which material will be taught in HuBi2004, and can re-assure you that the course is designed as an introductory level course and will be covering material at that level. We have progression maps for all our core concepts (Beginner —> Intermediate —> Advanced), but these are quite complex (there are over 125 core concepts identified and mapped) and so were not shared in the package. We will happily share with you though if needs be. We are happy to change the description of HuBi2004 to "biochemical traits" as suggested.

As indicated above, we did extensive concept mapping and progression analysis during our 18 months of curriculum planning and while we appreciate the suggestion, we are satisfied based on our progression maps, that the pre-requisites articulated are sufficient and appropriate for the planned content and delivery of HuBi3004.

With respectfully disagree that HuBi3005 is primarily focused on food issues. Allergens and allergenicity are by no means restricted to food - drug allergies (eg. penicillin, iodine, vaccines), allergies to chemicals or other components of the environment (bee stings, latex, pollen) are

incredibly commonplace. The proposed course outline also explicitly indicates that xenobiotic and drug metabolism (i.e Phase I/Phase II metabolism), pollutants, physical activity, and mental health topics will be covered. As course content becomes finalized it would not be surprising if the times currently estimated for each topic change somewhat, but we are comfortable that the proposed name of the course is reflective of the content.

Thanks, and we look forward to continuing to work collegially with the Department of Biology (even if we may occasionally have to agree to disagree) as we introduce our new programming.

From: "Wiersma, Yolanda" <<u>ywiersma@mun.ca</u>>
Date: Monday, November 21, 2022 at 9:48 AM
To: Biochemistry Head <<u>biochead@mun.ca</u>>, Valerie Booth <<u>vbooth@mun.ca</u>>, Janet Brunton
<<u>ibrunton@mun.ca</u>>
Cc: biologyhead <<u>biology.head@mun.ca</u>>
Subject: RE: Consultation on Biochemistry

Thanks Mark et al.,

Your department has inspired us to try the same exercise to review and re-examine our program; we wish you the best in implementing this. It is very exciting. Thanks for the opportunity to provide collegial feedback.

Yolanda

Hi Yolanda

That's good to hear. If there's anything we can do advice or help wise as you start the process, feel free to reach out. We're more than willing.

We've actually submitted the whole process and programme for the education section at a meeting next summer, so hopefully we'll have a 15 minute presentation on the process to prepare. I'd have to check with Amy, but I'm sure she'd be happy to give that as a seminar next Spring if you wanted.

Mark

Paper 5.A.y. (pages 197-349)

APPENDIX 6

Course Schedule Advise Sheet

Sample HUBI Core Schedule (to go on website as student advice)

	Fall	Winter
Year 1	Chem 1050 Biol 1001 Math 1000 (or, if needed, complete Math 1090 and complete Math 1000 in Winter of Year 1) English	Chem 1051 Hubi 1001 or Biol 1002 English or CRW course
Year 2	Chem 2400 Hubi 2001 Hubi 2002 Stats 2550 (could do in Winter) *recommend taking Biol 1002	Hubi 2003 Hubi 2004 Hubi 2901
Year 3	Med 310A Hubi 3001 Hubi 3002 Hubi 3003 Hubi 3906 (Majors could do in 4 th year)	Med 310B Hubi 3004 Hubi 3005 Hubi 3907 (Majors could do in 4 th year)
Year 4	Major: Hubi 4800 + 2 other 4000-level Hubi courses Honours: Hubi 4800, Hubi 499A/B, 3 Hubi courses at 4000 level, + 2 additional Hubi courses at 3000 or 4000 level	

*if not taken already, to leave open the possibility of switching into a Biology Major and completing a Biology degree without delays APPENDIX 7 – Feedback from undergraduate current Biochemistry and Nutrition majors

APPENDIX 7

Feedback on the new Human Biosciences program

Timestamp	Overall, what are your thoughts on the new program?	
2022/10/29 3:33:12 PM GMT-2:30	It is a step in the right direction.	
2022/11/08 10:53:03 PM GMT-3:30	Best decision the faculty has ever made	
2022/11/09 3:36:08 PM GMT-3:30	I think it is a great idea and really a step in the right direction! If I was about to choose a major in the science faculty I would absolutely be picking this one.	
2022/11/17 11:10:11 AM GMT-3:30	Overall I think this is an amazing overhaul of the current program. I think it will appeal to a broader audience of first year students and it also seems to be very well organized and makes the degree as a whole more manageable.	
2022/11/21 2:17:18 PM GMT-3:30	I really like and appreciate the new program. I am impressed by the level of interdisciplinary the new program is. I am in my third year now and seeing the new concentrations are very interesting and Would have been very exciting for a first-year student looking into starting a biochemistry degree.	
2022/11/21 2:18:29 PM GMT-3:30	The Human Bioscience program seems like it can be a great opportunity for new students to focus more on biochem courses earlier in their degree rather than taking several first year courses such as physics and a second CRW.	

What about the new program do you like?	What about the new program do you dislike?
The ability to choose a focus area.	The requirement for chemistry 2400 and medicine 310A/B. If the courses were simplified, I could see it being useful - but the complexity of these courses is beyond what most students need and they are typically a GPA dropper.
The focus on human based sciences	May not be everyone's future field of interest
- Really like how there will be multiple concentrations to choose from.	No complaints! It all looks great!
- I don't mind the separate biochemistry and nutrition streams but it's nice that it's all one program now	
-The new metabolism course is a great idea!	
- Yay for no more physics!	
 I think the best thing is that students can either take Bio 1002 or the Biosciences 1001 (BIOC 1600). It gives students multiple pathways that they can choose in their first year of studies. Also if a student is unsure about if they want to do human biosciences, they can still take bio 1002 and apply to biology or chemistry if they happen to change their mind. BIOC 1600 was easily one of the best courses that I took during my degree and I was very pleased to see it incorporated into the new program. The knowledge that I gained from that course has been extremely beneficial and I have been able to apply that to other courses that I have taken in my degree. It is also a course that has information relevant to each proposed concentration. Definitely a smart choice to have that as a potential path of entry into the program. 	
I think the new layout of courses makes the degree path a little less daunting. Splitting up metabolism and offering some biochem courses earlier in the degree are both really appealing to me having already gone through most of my biochem degree. I also really like the new concentrations (disease, molecular bio, etc). I think a lot of people in Biochem want to go into the medical field or human sciences, and those concentrations are definitely going to be more popular than the current minor options.	I believe there shouldn't be a Chem 2400 prerequisite for what is the old Bioc 2201. I took 2400 as a co requisite and it was absolutely fine. There is no need to hold off on taking the Biochem course until you complete the organic chem, in my opinion. I think this change would let people take 2201 in their first semester of second year and better space out their biochem/hubi courses! Personally I found it much more manageable to take the old Bioc 2201 in the fall of my second year, and then the old Bioc 2200 and 2901 in the winter. I know typically people do 2901 in the fall, but I honestly think that's very daunting compared to first taking 2201. 2901 is a bit nerve wracking for a lot of second years because none of us have any biochem lab experience going in. I think being able to take 2201 in the fall and 2901 in the winter is a better setup- but that's just my personal opinion!
The thing I like most about the new program is how inclusive it is to different students which will allow for a more diverse student population. For example, the option to complete Bio 1001 and Bioc 1600 is a very good entry point to a human bioscience degree. I found there was not much valuable information in bio 1002 to use further on in my degree. However, I did take Bioc 1600 last fall and it was a very good introduction to human bioscience, clinical trial processes, and nutrition. Also, another thing that I liked about the new program is that it has split up the metabolism courses. As being such a difficult concept/topic for some students it is good to make the course more accessible and then allow there to be further courses for students who are interested.	One thing that I dislike about the program is with the first year when you take 2901 in the fall and then 2201 in the winter. In my second year because of COVID, I was able to take 2201 and 2400 in the fall concurrently and 2901 in the winter. I found this very beneficial because I had prior knowledge of biochemistry before I took the lab course. However, if taken in the correct order I think it could be somewhat overwhelming.
The revamped metabolism being split into two different courses could be a very positive change for students as they will have a change to fully absorb what is taught rather than cramming as much info into a small time frame	 If I were to change anything with the new program, I would remove the need to take stats 2250. Replace this course with a research methods course that is more applicable to biochemistry. Many students struggle with stats because of the language barrier between the students and the profs. If biochemistry could offer an equivalent course this would be much easier for students.

Are there any comments/concerns that you would like to pass onto the department?	Any questions?
Other than stated above, no.	When will this program be implemented? Will current students be transferred to the new regulations and degree name?
Happy to hear it	N/A
N/A	For people applying to graduate programs that have specific pre-requisites, how will this affect the a potential required biochemistry course that may be needed?
	Will the entry to each concentration be competitive with a limited number of seats for each?
	Do you have to choose a concentration or can you just complete the degree with your major as Human Biosciences?
You guys rock!! This is an awesome new program and I really wish I was restarting my degree so I could take it!	N/A
No	No
no	no

Report from Department of Biology re: Consultation on proposed undergraduate calendar change proposal from Department of Biochemistry (revised program title: BSc in Human Biosciences)

Thank you for the opportunity to provide feedback on the proposed Program change. We are impressed by the collective effort your department put in to critically reviewing your program, and revising it to consider skills and competencies as per your AUP.

We are curious if the goal here is to essentially re-cast Biochemistry as a "Pre-Med" program. This is obviously strategic in terms of recruiting students with aspirations for Medical School, but on the other hand, it has the potential to be limiting. If this is the underlying current, it should be acknowledged that any medical/health focus in this program is strictly limited to health at the level of biomolecules and cells.

We have grouped our comments under four headings:

1. Program title

- 2. Program regulations
- 3. Concentrations
- 4. Specific courses

1. Program title

We have serious concerns about the use of the term "Biosciences" in your program name. We know that you put a great deal of careful thought in the program name, but we are concerned with overlap with our department name. We feel the proposed name will be confusing to prospective and current students. Put simply, "bioscience" is the same as "Biology". The Merriam- Webster online dictionary defines "Bioscience" as "Biology" (Figure 1).

Moreover, if we use journal titles, aims and scope as a guide to defining a field of study, a close look at the web page for *BioScience* (published by Oxford Academic for the American Institute of Biological Sciences) is instructive. On the "About page" (screenshot in Figure 2), it states "Since 1964, *BioScience* has presented readers with timely and authoritative overviews of current research in biology, accompanied by essays and discussion sections on education, public policy, history, and the conceptual underpinnings of the biological sciences." Note there is no mention in the Aims and Scope of biochemistry, or the "foundational biochemical, nutrition and molecular concepts" which are the concepts outlined in this program proposal. A keyword search for these three terms within the journal *BioScience* yields very few hits (see Table 1, and Appendices A1-A3). With regards to the concept of biochemistry, only 1 of these papers

appears to be aligned with the topics outlined in this proposal; a very dated paper on neurotransmitter release (Van Der Kloot and Kita 1974). There are a few more papers in *BioScience* related to nutrition; however one of these is related to research in archaeology (Larsen et al. 2022), and others to sustainable food systems (i.e., environmental science, e.g., Schipanski et al. 2016; Nogeire-McRae et al. 2018) or landscape ecology (e.g., Gergel et al. 2020). The one nutrition paper that appears more aligned with molecular-level work in the journal *BioScience* is focused on animal nutrition (McCue 2011). There are 60 papers in *BioScience* with "molecular*" in the title, abstract or keywords, but only a handful appear to have a human focus (Ben-Ari 1999; Phillips 2008; Stone 2012; Farrell et al. 2021); the majority focus on non-human organisms (e.g., bacteria, crop plants, animals).

While the argument might be that by placing the adjective "Human" in front of the program name, the program/department are distinguishing themselves from other units at the university, we would argue that "Human Biosciences" as a title is just as misleading for potential and current students, as well as employers and post-grad programs looking at the student's degree name. A comprehensive program in human biosciences would include biological work above the level of the cell, including histology (currently taught in our unit), bio-locomotion (work done here at Memorial in the School of Human Kinetics), neurological and mental health dimensions (covered by our Psychology Department) and work on human-environment interactions. For example, the University of Toronto has a "Human Biology" program, which includes four areas of study (Fundamental Genetics and its Applications; Global Health; Health & Disease; Neuroscience). Their program includes courses that are not included in this proposal, including courses in histology and histopathology, global health issues, neurobiology, and exercise physiology. Thus, a program called "Human Biosciences"-while no doubt an appealing program name for students—should be more comprehensive than what is proposed here, and consider more than human cellular and sub-cellular systems. Similarly, the University of Guelph has a Department of Human Health and Nutritional Science, which includes courses in physiology, anatomy and pathology; topics not included in the current proposal.

Given the specific focus in your unit on cellular and sub-cellular processes of human systems, we find it hard to see how this program can claim to be "interdisciplinary" – it does not touch on other scientific disciplines, nor does it interact across other disciplinary boundaries such as the social sciences and humanities. Moreover, there is overlap conceptually with human dimensions of biology in other units (Psych, HKR, Biology) – for example our BIOL 3295 Population Ecology and Evolution cover human population dynamics, demography and infectious disease spread. Down the line, an interdisciplinary program in Human Biology that spanned your unit, Biology, HKR, Psychology and Medicine (among others) would be an amazing program to offer our students.

2. Program regulations

We have some concerns with the Admission to the Major requirement 11.X.1.1, item 1e, which states BIOL 1002 or Human Biosciences 1001 (or Biochemistry 1600). Because BSc students at Memorial do not declare a Major until completion of first year, and given that all of Biology's second-year courses require both BIOL 1001 AND BIOL 1002, we are concerned that first year students who opt to take HUBI 1001 (which does not have a lab) over BIOL 1002 (which has a lab) will have limited options in year 2 should they elect to do a Biology Major. If there are good pedagogical reasons for not including BIOL 1002 as a PR for your second year courses, then communication with applying and first-year students about the implications of taking HUBI 1001 over BIOL 1002 need to be clearly communicated.

The above concern about BIOL 1002 vs HUBI 1001 also applies to the following:

- 11.x.2.1 (Major in Human Biosciences 1.b)
- 11.x.2.2 (Honours Degree in Human Biosciences) 1.b.

We are curious about the statement "Students who have appropriate high school equivalent courses would be admitted directly into the Human Biosciences major". What kind of high school equivalency courses would be needed for direct entry?

Some minor suggestions in the program regulations for the Human Biosciences and Cell Biology Joint Honours (section 10.2.3 in the proposal).

- Item8 we suggest you remove BIOL 4251 (Genomics) as the Biology department is not longer able to offer this
- Item 8 we suggest you remove BIOL 4251 (Evolutionary Genetics); this course is not appropriate for Human Biosciences as it does not have a human focus.

3. Concentrations

Two of the proposed concentrations, 11.x.x.2 Health and Disease and 11.x.x.3 Molecular Biology are extremely similar sounding to two of Biology's concentrations, Biology for Health Professionals and Molecular, Microbial and Cell Biology. Yet between the two departments, the list of possible courses to select from for the concentration is quite different, as is the number of credit hours (15 credit hours for the concentrations in Human Biosciences, and 18 credit hours for the concentrations in Biology). Given the close alignment of the two departments, we feel that the number of courses for a concentration should be equivalent between the Departments of Biology and the Department of Biochemistry/Human Biosciences. We compared the course listings between the two departments for Molecular Biology in Table 2a and for the Health concentrations in Table 2b. Only two courses overlap in the Heath concentration and only four (of 15 and 9 possible in Biology and Human Biosciences respectively) in the Molecular Biology stream. This seems to be fairly minimal overlap, suggesting that they may be quite different concentrations (students taking a concentration within the Biology program will have a very different experience from students taking a similar concentration within the Human Biosciences program) and should probably be renamed. As well, some of the Biology courses listed under the Human Biosciences concentration are not particularly human-focused (some, like BIOL 4250 Evolutionary Genetics do not discuss human aspects at all), and thus may not fit well within a Human Biosciences program. On the other hand, BIOL 3050 (Microbiology) might be a strategic fit for the concentration in Health and Disease.

4. Specific courses

We appreciate the introduction of a 2nd-year level Metabolism course—the new HUBI 2003—to replace the former Biochemistry 3206. We anticipate making HUBI 2003 the pre-requisite for our courses that formerly listed Biochemistry 3206 as a PR (3 courses in BIOL total); we are contemplating dropping Metabolism as a requirement for all Majors, but have not made a decision on this yet and plan to let the new course run for a few years before making a decision.

We only have comments on the following courses:

HUBI 2004 Fundamentals of Modern Molecular Biology

The two courses that this replaces (Biochemistry 2100 and 2200) were ones that historically had a high degree of overlap with two of our courses (BIOL 2250 – Principles of Genetics and BIOL 2060 Principles of Cell Biology). Our assessment of the new slate of courses proposals is that there is less overlap than previously.

We looked over the proposed syllabus carefully with faculty in our unit who have taught BIOL 2250 and 2060. The overall assessment is that the proposed HUBI 2004 is potentially more advanced than BIOL 2250 (i.e., it focuses more on topics in the second half of the text book), yet easier to get into (HUBI 2004 requires only BIOL 1001/1002; BIOL 2250 requires both BIOL 1001, and 1002 plus Chemistry 1050. The topics proposed in weeks 1-3 of HUBI 2004 overlap with the topics in BIOL 2250, but essentially, our faculty felt they are two distinct courses, which is great and does solve quite a bit of the previous issues with overlap between BIOL 2250 and Biochemistry 2100 and 2200. A number of the topics in HUBI 2004 (weeks 4-5, 9, 10 are touched on in BIOL 2250, but not in depth. Several topics in HUBI 2004 (weeks 1-2, 4, 7 and 9) overlap with topic taught in BIOL 2060, so perhaps we still have issues of overlap/duplication there.

We do have two small queries/suggestions for wording of the calendar description...

Should it read "heritability of simple traits from genotype to phenotype"? We suggest replacing "simple traits" with "biochemical traits.

HUBI 3004 Cellular Signalling

It was suggested to add BIOL 2060 (Principles of Cell Biology) to the pre-requisites for this course.

HUBI 3005 Environment-Health Interactions

We suggest rethinking the course title. The course appears to be mainly about food issues (allergens, additives, etc.) and effects on cellular-homeostasis, which is quite a bit narrower than "environment" and "health" which could include things like air quality and respiratory diseases, built environments and physical and mental health, soils/water quality and disease, etc.
Table 1. Results of search on keyword combinations constrained to the journal *BioScience* using the journal database Scopus. Search date 7-November-2022. For context, the journal has been extant since 1964 and has published thousands of articles.

Search string	Number of articles
(TITLE-ABS-	9
KEY (biochem*) AND SRCTITLE ("BioScience")) AND (LIMIT-	
TO (EXACTSRCTITLE, "Bioscience"))	
(TITLE-ABS-KEY(nutrition*) AND SRCTITLE("BioScience")) AND (15
LIMIT-TO (EXACTSRCTITLE, "Bioscience"))	
(TITLE-ABS-	60
KEY (molecular*) AND SRCTITLE ("BioScience")) AND (LIMIT-	
TO (EXACTSRCTITLE, "Bioscience"))	

Table 2a. Comparison of two molecular concentrations between the Department of Biology and the proposed program in Human Biosciences. Courses in common between each department's concentration are shaded in grey.

Biology for Health Professions		Health and Disease			
(Biology)	Program)	(Human Biosciences Program)			
Course Code	Course Title	Course Code	Course Title		
BIOL 3050	Introduction to	HUBI 3101	Immunology		
	Microbiology				
BIOL 3052	Food Microbiology	HUBI 3600	Sports and Exercise		
			Nutrition		
BIOL 3500	Histology	HUBI 4105	??		
BIOL 4010	Virology	HUBI 4230	Lipid and		
			Lipoprotein		
			Metabolism		
BIOL 4050	Advanced Topics in	HUBI 4231	Molecular Biology		
	Microbiology		of the Bacterial-		
			Human Interface		
BIOL 4200	Immunology	HUBI 4301	Nutrition and		
			Disease		
BIOL 4241	Advanced Genetics	HUBI 4240	Gene-Nutrient		
			Interactions and		
			Personalized		
			Nutrition		
BIOL 4245	Biophysics	BIOL 3052	Food Microbiology		
BIOL 4404	Microbial	CHEM 4702	?? Not listed in		
	Physiology		calendar		
BIOL 4550	Principles of				
	Endocrinology				
Medicine 310A	Human Physiology				
Medicine 310B	Human Physiology				

Table 2b. Comparison of two health concentrations between the Department of Biology and the proposed program in Human Biosciences. Courses in common between each department's concentration are shaded in grey.

Molecular, Microbial and Cell		Molecular Biology			
Biology (Biology Program)		(Human Biosciences Program)			
Course Code	Course Title	Course Code	Course Title		
BIOL 3050	Introduction to	HUBI 3207	Nucleic Acid		
	Microbiology		Biochemistry and		
			Molecular Biology		
BIOL 3052	Food Microbiology	HUBI 4101	Proteins		
BIOL 3401	Comparative	HUBI 4104	Eukaryotic Gene		
	Animal Physiology		Regulation and		
			Developmental		
			Biology		
BIOL 3402	Principles of Plant	HUBI 4231	Molecular Biology		
	Physiology		of the Bacterial-		
			Human Interface		
BIOL 3530	Molecular and	HUBI 4240	Gene-Nutrient		
	Developmental		Interactions and		
	Biology		Personalized		
			Nutrition		
BIOL 3950	Research Methods	BIOL 2250*	Principles of		
	in Genetic		Genetics		
DIOL	Biotechnology	DIOL	T 1 1 1		
BIOL 3951	Introduction to	BIOL 3951	Introduction to		
	Bioinformatics	DIOL 10.11	Bioinformatics		
BIOL 4050	Advanced Topics in Microbiology	BIOL 4241	Advanced Genetics		
BIOL 40.41	Advanced Consting	BIOL 4606	Bioinformation		
DIOL 4241	Auvaliceu Gelletics	DIOL 4000	Biological Data		
			Analysis		
BIOL 4250	Evolutionary				
D10114230	Genetics				
BIOL 4251	Genomics				
BIOL 4404	Microbial				
	Physiology				
BIOL 4606	Bioinformatics:				
	Biological Data				
	Analysis				
Biochemistry 3207	Nucleic Acid				
(proposed HUBI	Biochemistry and				
3207)	Molecular Biology				

*BIOL 2250 is part of the Core for all Biology Majors, thus it is not part of this concentration for Biology students, as they will have already taken it.



Figure 1. Screenshot from Merriam-Webster.com captured 7-November-2022

				· _	· -				
OXFC	DRD Journ	nals Bool	ks					e	9 8
BioScience						AMERICAN INST BIOLOGICAL SCIE	ITUTE OF ENCES		
Issues	More Content 🔻	Submit 🔻	Purchase	Alerts	About 🔻	BioScience	•	Q	Advanced Search

About the Journal

Since 1964, *BioScience* has presented readers with timely and authoritative overviews of current research in biology, accompanied by essays and discussion sections on education, public policy, history, and the conceptual underpinnings of the biological sciences.

A peer-reviewed, heavily cited, monthly journal with content written and edited for accessibility to researchers, educators, and students alike.

BioScience includes articles about research findings and techniques, advances in biology education, professionally written feature articles about the latest frontiers in biology, discussions of professional issues, book reviews, news about AIBS, a policy column (Washington Watch), and an education column (Eye on Education). Roundtables, forums, and viewpoint articles offer the perspectives of opinion leaders and invite further commentary.

Occasional special sections in *BioScience* provide an in-depth look at important topics. Recent special sections have addressed ecological boundaries, protected areas, acid rain, science and public policy, the US Long Term Ecological Research network, and agricultural bioterrorism.

BioScience's precursor, AIBS Bulletin, was published until 1964. AIBS Bulletin content is available via the BioScience website.



Figure 2. Screenshot from the journal *BioScience* home page, captured 7-November-2022.

Appendix A.1. List of 9 articles in the journal *BioScience* with title, abstract or keyword biochem* based on a search in the journal index Scopus 7-November-2022

```
Scopus
EXPORT DATE:07 Nov 2022
Mallin, M.A., Cahoon, L.B.
7004638737;6603685755;
The Hidden Impacts of Phosphorus Pollution to Streams and Rivers
(2020) BioScience, 70 (4), pp. 315-329.
https://www.scopus.com/inward/record.uri?eid=2-s2.0-
85086026287&doi=10.1093%2fbiosci%2fbiaa001&partnerID=40&md5=51f3204b8bf910c9f
97f52445615e89e
DOI: 10.1093/biosci/biaa001
DOCUMENT TYPE: Review
SOURCE: Scopus
Balgopal, M.M., Casper, A.M.A., Wallace, A.M., Laybourn, P.J., Brisch, E.
28067483700;57217673823;36714415000;7006741065;6506386754;
Writing Matters: Writing-to-Learn Activities Increase Undergraduate
Performance in Cell Biology
(2018) BioScience, 68 (6), pp. 445-454.
https://www.scopus.com/inward/record.uri?eid=2-s2.0-
85048610286&doi=10.1093%2fbiosci%2fbiy042&partnerID=40&md5=ac9ed1106534b32538
d77a6f2eb078f3
DOI: 10.1093/biosci/biy042
DOCUMENT TYPE: Article
SOURCE: Scopus
Satir, P., Heuser, T., Sale, W.S.
7007020213;54882730200;7004321670;
A structural basis for how motile cilia beat
(2014) BioScience, 64 (12), pp. 1073-1083.
https://www.scopus.com/inward/record.uri?eid=2-s2.0-
84922417699&doi=10.1093%2fbiosci%2fbiu180&partnerID=40&md5=0c23ff5af5377f1f94
0e46fe25305eaf
DOI: 10.1093/biosci/biu180
DOCUMENT TYPE: Review
SOURCE: Scopus
Sorek, N., Yeats, T.H., Szemenyei, H., Youngs, H., Somerville, C.R.
16043582300;13104003000;23971549000;6602951904;57190784600;
The implications of lignocellulosic biomass chemical composition for the
production of advanced biofuels
(2014) BioScience, 64 (3), pp. 192-201.
https://www.scopus.com/inward/record.uri?eid=2-s2.0-
84899018609&doi=10.1093%2fbiosci%2fbit037&partnerID=40&md5=e06963d7f05602ead9
8209a1a47c494c
DOI: 10.1093/biosci/bit037
DOCUMENT TYPE: Article
SOURCE: Scopus
```

Coops, N.C., Hilker, T., Hall, F.G., Nichol, C.J., Drolet, G.G. 54790508000;15841308100;7401636555;10143777600;57194168161; Estimation of light-use efficiency of terrestrial ecosystems from space: A status report (2010) BioScience, 60 (10), pp. 788-797. https://www.scopus.com/inward/record.uri?eid=2-s2.0-78149274566&doi=10.1525%2fbio.2010.60.10.5&partnerID=40&md5=d284b1c22be92bb11 43683c8e40dac4e DOI: 10.1525/bio.2010.60.10.5 DOCUMENT TYPE: Article SOURCE: Scopus Raffa, K.F., Aukema, B.H., Bentz, B.J., Carroll, A.L., Hicke, J.A., Turner, M.G., Romme, W.H. 7005133371;6701756758;7005498956;7202435541;6602075624;7403215651;7004245729; Cross-scale drivers of natural disturbances prone to anthropogenic amplification: The dynamics of bark beetle eruptions (2008) BioScience, 58 (6), pp. 501-517. https://www.scopus.com/inward/record.uri?eid=2-s2.0-45849137124&doi=10.1641%2fB580607&partnerID=40&md5=cddd1c37c0756a7b4a83ea8192 454a92 DOI: 10.1641/B580607 DOCUMENT TYPE: Review SOURCE: Scopus Yeager, R.L., Parkhurst, D.F., Henshel, D.S. 8583266100;7004113116;56058858400; Graphical methods for exploratory analysis of complex data sets (2007) BioScience, 57 (8), pp. 673-679. https://www.scopus.com/inward/record.uri?eid=2-s2.0-34548678920&doi=10.1641%2fB570807&partnerID=40&md5=4472f6f3b9d246c4446b84383a cab43d DOI: 10.1641/B570807 DOCUMENT TYPE: Article SOURCE: Scopus Weis, J.S., Smith, G., Zhou, T., Santiago-Bass, C., Weis, P. 7202856424;56172164700;55568529095;6507982349;7007170967; Effects of contaminants on behavior: Biochemical mechanisms and ecological consequences (2001) BioScience, 51 (3), pp. 209-217. https://www.scopus.com/inward/record.uri?eid=2-s2.0-0035026987&doi=10.1641%2f0006-3568%282001%29051%5b0209%3aE0C0BB%5d2.0.C0%3b2&partnerID=40&md5=4a3f89b147a73 fa03955196699c9fdb2 DOI: 10.1641/0006-3568(2001)051[0209:EOCOBB]2.0.CO;2 DOCUMENT TYPE: Article SOURCE: Scopus Van Der Kloot, W., Kita, H. 7006708406;7202399459; Mechanisms for neurotransmitter release (1974) BioScience, 24 (1), pp. 13-17.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-0015979413&doi=10.2307%2f1296654&partnerID=40&md5=2c3042efbf1cf555770ec02baac 577dc

DOI: 10.2307/1296654 DOCUMENT TYPE: Article **Appendix A.2.** List of 15 articles in the journal *BioScience* with title, abstract or keyword nutrition* based on a search in the journal index Scopus 7-November-2022

```
Scopus
EXPORT DATE:07 Nov 2022
Larsen, T., Fernandes, R., Wang, Y.V., Roberts, P.
36990705500;35112991800;23502374400;55066401000;
Reconstructing Hominin Diets with Stable Isotope Analysis of Amino Acids: New
Perspectives and Future Directions
(2022) BioScience, 72 (7), pp. 618-637.
https://www.scopus.com/inward/record.uri?eid=2-s2.0-
85133516762&doi=10.1093%2fbiosci%2fbiac028&partnerID=40&md5=ff5aa8c975fc8f851
2ce7341a19c2ad1
DOI: 10.1093/biosci/biac028
DOCUMENT TYPE: Review
SOURCE: Scopus
Peace, A., Frost, P.C., Wagner, N.D., Danger, M., Accolla, C., Antczak, P.,
Brooks, B.W., Costello, D.M., Everett, R.A., Flores, K.B., Heggerud, C.M.,
Karimi, R., Kang, Y., Kuang, Y., Larson, J.H., Mathews, T., Mayer, G.D.,
Murdock, J.N., Murphy, C.A., Nisbet, R.M., Pecquerie, L., Pollesch, N.,
Rutter, E.M., Schulz, K.L., Scott, J.T., Stevenson, L., Wang, H.
37034892200;7101808314;36164729200;24773300500;56538611000;25639554100;720157
2161;13806710100;57189441182;43461192400;56841681000;12141448100;35800061400;
7103312315;8588742000;24278420500;7201807480;16317009100;35290855400;57204248
585;25822562700;56576327800;37102556300;7201642655;24779002100;57210720050;34
772112800;
Stoichiometric Ecotoxicology for a Multisubstance World
(2021) BioScience, 71 (2), pp. 132-147.
https://www.scopus.com/inward/record.uri?eid=2-s2.0-
85104986840&doi=10.1093%2fbiosci%2fbiaa160&partnerID=40&md5=57235fd291e5a1e86
36ff9b259f013f3
DOI: 10.1093/biosci/biaa160
DOCUMENT TYPE: Article
SOURCE: Scopus
Gergel, S.E., Powell, B., Baudron, F., Wood, S.L.R., Rhemtulla, J.M.,
Kennedy, G., Rasmussen, L.V., Ickowitz, A., Fagan, M.E., Smithwick, E.A.H.,
Ranieri, J., Wood, S.A., Groot, J.C.J., Sunderland, T.C.H.
6602589644;35724661500;26634749900;57191753646;6504520281;7201789159;53664306
400;6507052223;53871259200;7003875365;57219201730;36635198300;7006206516;1933
8072100;
Conceptual links between landscape diversity and diet diversity: A roadmap
for transdisciplinary research
(2020) BioScience, 70 (7), pp. 563-575.
https://www.scopus.com/inward/record.uri?eid=2-s2.0-
85080121271&doi=10.1093%2fbiosci%2fbiaa048&partnerID=40&md5=a996dc273c59a7f5a
737eee6d0aed61d
DOI: 10.1093/biosci/biaa048
DOCUMENT TYPE: Review
SOURCE: Scopus
```

Nogeire-McRae, T., Ryan, E.P., Jablonski, B.B.R., Carolan, M., Arathi, H.S., Brown, C.S., Saki, H.H., McKeen, S., Lapansky, E., Schipanski, M.E. 25923544000;56760942300;56653358900;7004240106;57391641600;57206179596;572061 93546;57206206406;57206199527;34972127100; The role of urban agriculture in a secure, healthy, and sustainable food system (2018) BioScience, 68 (10), pp. 748-759. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85061572885&doi=10.1093%2fbiosci%2fbiy071&partnerID=40&md5=958c30424aa186e4cc 4dd9be5d2ffd6a DOI: 10.1093/biosci/biy071 DOCUMENT TYPE: Review SOURCE: Scopus Mumby, P.J., Steneck, R.S. 7003596162;6701822254; Paradigm lost: Dynamic nutrients and missing detritus on coral reefs (2018) BioScience, 68 (7), pp. 487-495. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85050913097&doi=10.1093%2fbiosci%2fbiy055&partnerID=40&md5=1c19ddba2d0001a080 92f3f13f7c58a1 DOI: 10.1093/biosci/biy055 DOCUMENT TYPE: Review SOURCE: Scopus Schipanski, M.E., MacDonald, G.K., Rosenzweig, S., Chappell, M.J., Bennett, E.M., Kerr, R.B., Blesh, J., Crews, T., Drinkwater, L., Lundgren, J.G., Schnarr, C. 34972127100;26534721900;57062134100;56684493900;7201460901;35145276900;557933 23900;7006267464;6603876520;57203033152;57191844365; Realizing resilient food systems (2016) BioScience, 66 (7), pp. 600-610. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84994087193&doi=10.1093%2fbiosci%2fbiw052&partnerID=40&md5=a49059712eac3fff36 9ce64917033864 DOI: 10.1093/biosci/biw052 DOCUMENT TYPE: Review SOURCE: Scopus Pawlik, J.R., Burkepile, D.E., Thurber, R.V. 7005422573;8771715800;23986487200; A Vicious Circle? Altered Carbon and Nutrient Cycling May Explain the Low Resilience of Caribbean Coral Reefs (2016) BioScience, 66 (6), pp. 470-476. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84975743940&doi=10.1093%2fbiosci%2fbiw047&partnerID=40&md5=ff4325be0c610dd8dd 31347bf6737209 DOI: 10.1093/biosci/biw047 DOCUMENT TYPE: Review SOURCE: Scopus MacDonald, G.K., Brauman, K.A., Sun, S., Carlson, K.M., Cassidy, E.S., Gerber, J.S., West, P.C.

26534721900;23059768400;26424022700;35175576500;54396857900;54397087000;36192 505200; Rethinking agricultural trade relationships in an era of globalization (2015) BioScience, 65 (3), pp. 275-289. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84935455767&doi=10.1093%2fbiosci%2fbiu225&partnerID=40&md5=a2e10e79a79b688607 80d329b517298b DOI: 10.1093/biosci/biu225 DOCUMENT TYPE: Review SOURCE: Scopus McCue, M.D. 15755987500; Tracking the oxidative and nonoxidative fates of isotopically labeled nutrients in animals (2011) BioScience, 61 (3), pp. 217-230. https://www.scopus.com/inward/record.uri?eid=2-s2.0-79952551313&doi=10.1525%2fbio.2011.61.3.7&partnerID=40&md5=7c5fdc3ad2ebc10732 abbd08f154ba1d DOI: 10.1525/bio.2011.61.3.7 DOCUMENT TYPE: Article SOURCE: Scopus Caron, D.A. 8446137600; New accomplishments and approaches for assessing protistan diversity and ecology in natural ecosystems (2009) BioScience, 59 (4), pp. 287-299. https://www.scopus.com/inward/record.uri?eid=2-s2.0-67649791192&doi=10.1525%2fbio.2009.59.4.7&partnerID=40&md5=5e1df30d1e6dc7365f 31e8e6828520b0 DOI: 10.1525/bio.2009.59.4.7 DOCUMENT TYPE: Article SOURCE: Scopus Cooke, S.J., Suski, C.D. 24320083600;6603548762; Ecological restoration and physiology: An overdue integration (2008) BioScience, 58 (10), pp. 957-968. https://www.scopus.com/inward/record.uri?eid=2-s2.0-55549110091&doi=10.1641%2fB581009&partnerID=40&md5=adc090c81857f609650154979b 31465e DOI: 10.1641/B581009 DOCUMENT TYPE: Review SOURCE: Scopus Losey, J.E., Vaughan, M. 6701583872;12807570800; The economic value of ecological services provided by insects (2006) BioScience, 56 (4), pp. 311-323. https://www.scopus.com/inward/record.uri?eid=2-s2.0-33645760408&doi=10.1641%2f0006-

3568%282006%2956%5b311%3aTEVOES%5d2.0.CO%3b2&partnerID=40&md5=60ecb939b43b1fa e10c7893a03946e34 DOI: 10.1641/0006-3568(2006)56[311:TEVOES]2.0.CO;2 DOCUMENT TYPE: Review SOURCE: Scopus Lu, B.-R., Snow, A.A. 7401752262;7103019985; Gene flow from genetically modified rice and its environmental consequences (2005) BioScience, 55 (8), pp. 669-678. https://www.scopus.com/inward/record.uri?eid=2-s2.0-23244450054&doi=10.1641%2f0006-3568%282005%29055%5b0669%3aGFFGMR%5d2.0.CO%3b2&partnerID=40&md5=35071d24b7608 9a07eb9d1e50d044e3f DOI: 10.1641/0006-3568(2005)055[0669:GFFGMR]2.0.CO;2 DOCUMENT TYPE: Review SOURCE: Scopus DeHayes, D.H., Schaberg, P.G., Hawley, G.J., Strimbeck, G.R. 6602139613;6603700938;7007018870;6603181714; Acid rain impacts on calcium nutrition and forest health (1999) BioScience, 49 (10), pp. 789-800. https://www.scopus.com/inward/record.uri?eid=2-s2.0-0032851322&doi=10.2307%2f1313570&partnerID=40&md5=290e45224b50a09fc226b2de7e3 29392 DOI: 10.2307/1313570 DOCUMENT TYPE: Article SOURCE: Scopus

Nutrition research policy called "failure" by OTA. (1978) Bioscience, 28 (11), pp. 688, 735. https://www.scopus.com/inward/record.uri?eid=2-s2.0-0018039479&doi=10.2307%2f1307317&partnerID=40&md5=5aa33a52bf753615075992dd428 5e0c5

DOI: 10.2307/1307317 DOCUMENT TYPE: Article SOURCE: Scopus **Appendix A.3.** List of 60 articles in the journal *BioScience* with title, abstract or keyword molecular* based on a search in the journal index Scopus 7-November-2022

```
Scopus
EXPORT DATE:07 Nov 2022
Farrell, J.A., Whitmore, L., Duffy, D.J.
57218923129;57218917823;36652535900;
The Promise and Pitfalls of Environmental DNA and RNA Approaches for the
Monitoring of Human and Animal Pathogens from Aquatic Sources
(2021) BioScience, 71 (6), pp. 609-625.
https://www.scopus.com/inward/record.uri?eid=2-s2.0-
85109533097&doi=10.1093%2fbiosci%2fbiab027&partnerID=40&md5=cd063825d397331b1
24027683d30a2e9
DOI: 10.1093/biosci/biab027
DOCUMENT TYPE: Article
SOURCE: Scopus
Lidgard, S., Love, A.C.
6603485537;7102497075;
Rethinking living fossils
(2018) BioScience, 68 (10), pp. 760-770.
https://www.scopus.com/inward/record.uri?eid=2-s2.0-
85061600739&doi=10.1093%2fbiosci%2fbiy084&partnerID=40&md5=2be0c0031e85eb7153
c0da13ec40c53f
DOI: 10.1093/biosci/biy084
DOCUMENT TYPE: Review
SOURCE: Scopus
Balgopal, M.M., Casper, A.M.A., Wallace, A.M., Laybourn, P.J., Brisch, E.
28067483700;57217673823;36714415000;7006741065;6506386754;
Writing Matters: Writing-to-Learn Activities Increase Undergraduate
Performance in Cell Biology
(2018) BioScience, 68 (6), pp. 445-454.
https://www.scopus.com/inward/record.uri?eid=2-s2.0-
85048610286&doi=10.1093%2fbiosci%2fbiy042&partnerID=40&md5=ac9ed1106534b32538
d77a6f2eb078f3
DOI: 10.1093/biosci/biy042
DOCUMENT TYPE: Article
SOURCE: Scopus
Guerrero-Bosagna, C.
8605905700;
Evolution with no reason: A Neutral view on epigenetic changes, genomic
variability, and evolutionary novelty
(2017) BioScience, 67 (5), pp. 469-476.
https://www.scopus.com/inward/record.uri?eid=2-s2.0-
85020220848&doi=10.1093%2fbiosci%2fbix021&partnerID=40&md5=78c75330bf41b26f10
7a0e4d60d2b05c
DOI: 10.1093/biosci/bix021
DOCUMENT TYPE: Article
SOURCE: Scopus
```

Paper 5.A.y. (pages 197-349)

Zhao, A., Qin, H., Fu, X. 57191158219;57191165024;7402205236; What determines the regenerative capacity in animals? (2016) BioScience, 66 (9), pp. 735-746. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84987643708&doi=10.1093%2fbiosci%2fbiw079&partnerID=40&md5=47dd06f8401351188e 0a0daf8d7d55d3 DOI: 10.1093/biosci/biw079 DOCUMENT TYPE: Review SOURCE: Scopus McCauley, D.W., Docker, M.F., Whyard, S., Li, W. 7005731293;7004430951;6603136957;35758637800; Lampreys as Diverse Model Organisms in the Genomics Era (2015) BioScience, 65 (11), pp. 1046-1056. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84947590222&doi=10.1093%2fbiosci%2fbiv139&partnerID=40&md5=549cc0765b94faf2ae 24b2106c68b135 DOI: 10.1093/biosci/biv139 DOCUMENT TYPE: Review SOURCE: Scopus Satir, P., Heuser, T., Sale, W.S. 7007020213;54882730200;7004321670; A structural basis for how motile cilia beat (2014) BioScience, 64 (12), pp. 1073-1083. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84922417699&doi=10.1093%2fbiosci%2fbiu180&partnerID=40&md5=0c23ff5af5377f1f94 0e46fe25305eaf DOI: 10.1093/biosci/biu180 DOCUMENT TYPE: Review SOURCE: Scopus Hershler, R., Liu, H.-P., Howard, J. 55963308600;7409756602;8517773600; Springsnails: A new conservation focus in western North America (2014) BioScience, 64 (8), pp. 693-700. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84905654444&doi=10.1093%2fbiosci%2fbiu100&partnerID=40&md5=ecb12c7051b4a95637 a8fad0650917ad DOI: 10.1093/biosci/biu100 DOCUMENT TYPE: Review SOURCE: Scopus White, P.J.T., Heidemann, M.K., Smith, J.J. 55473090200;6603497993;7410177634; A new integrative approach to evolution education (2013) BioScience, 63 (7), pp. 586-594. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84881506515&doi=10.1525%2fbio.2013.63.7.11&partnerID=40&md5=4eafc35cc51ffba4c ba653efc847b59c

Paper 5.A.y. (pages 197-349)

DOI: 10.1525/bio.2013.63.7.11 DOCUMENT TYPE: Article SOURCE: Scopus Stone, M. 55417683800; Molecular mug shots make catching foodborne pathogens easier (2012) BioScience, 62 (12), p. 1093. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84871253883&doi=10.1525%2fbio.2012.62.12.15&partnerID=40&md5=af7a79c71da10abd 48949b471d5047e4 DOI: 10.1525/bio.2012.62.12.15 DOCUMENT TYPE: Note SOURCE: Scopus Yokoyama, S. 7402757788; Synthesis of experimental molecular biology and evolutionary biology: An example from the world of vision (2012) BioScience, 62 (11), pp. 939-948. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84871238113&doi=10.1525%2fbio.2012.62.11.3&partnerID=40&md5=0dfea8f4705605843 3011b6a5db7e3d0 DOI: 10.1525/bio.2012.62.11.3 DOCUMENT TYPE: Review SOURCE: Scopus Snow, A.A., Smith, V.H. 7103019985;55344669800; Genetically engineered algae for biofuels: A key role for ecologists (2012) BioScience, 62 (8), pp. 765-768. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84865426920&doi=10.1525%2fbio.2012.62.8.9&partnerID=40&md5=1efee191894f942bdf d306ae1ef98e26 DOI: 10.1525/bio.2012.62.8.9 DOCUMENT TYPE: Review SOURCE: Scopus Hlodan, O. 12242745200; Molecular insights into classic examples of evolution (2011) BioScience, 61 (4), pp. 264-267. https://www.scopus.com/inward/record.uri?eid=2-s2.0-79953842087&doi=10.1525%2fbio.2011.61.4.4&partnerID=40&md5=906593b025c01d85d6 2e0bccebfefa3a DOI: 10.1525/bio.2011.61.4.4 DOCUMENT TYPE: Article SOURCE: Scopus Isaksson, C., Sheldon, B.C., Uller, T. 8699755500;35481336500;8297510800; The challenges of integrating oxidative stress into life-history biology (2011) BioScience, 61 (3), pp. 194-202.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-79952568626&doi=10.1525%2fbio.2011.61.3.5&partnerID=40&md5=b4999835d6e3a16b87 a0c71d5544f8f1 DOI: 10.1525/bio.2011.61.3.5 DOCUMENT TYPE: Article SOURCE: Scopus Hartley, L.M., Wilke, B.J., Schramm, J.W., D'Avanzo, C., Anderson, C.W. 36865408400;23669412700;55238690400;6603989748;7404306638; College students' understanding of the carbon cycle: Contrasting principlebased and informal reasoning (2011) BioScience, 61 (1), pp. 65-75. https://www.scopus.com/inward/record.uri?eid=2-s2.0-79751520965&doi=10.1525%2fbio.2011.61.1.12&partnerID=40&md5=d091fa445d49fb062 1a74b226df2bf3e DOI: 10.1525/bio.2011.61.1.12 DOCUMENT TYPE: Article SOURCE: Scopus Pausas, J.G., Verdú, M. 7004227580;7006992956; The jungle of methods for evaluating phenotypic and phylogenetic structure of communities (2010) BioScience, 60 (8), pp. 614-625. https://www.scopus.com/inward/record.uri?eid=2-s2.0-77956415193&doi=10.1525%2fbio.2010.60.8.7&partnerID=40&md5=9229525b92d8a2baf7 0ace64a05d03a4 DOI: 10.1525/bio.2010.60.8.7 DOCUMENT TYPE: Article SOURCE: Scopus Paige, K.N. 7003733856; The functional genomics of inbreeding depression: A new approach to an old problem (2010) BioScience, 60 (4), pp. 267-277. https://www.scopus.com/inward/record.uri?eid=2-s2.0-77950936619&doi=10.1525%2fbio.2010.60.4.5&partnerID=40&md5=913262de12ae5c106f 543c2460b478b3 DOI: 10.1525/bio.2010.60.4.5 DOCUMENT TYPE: Article SOURCE: Scopus Richards, C.L., Bossdorf, O., Pigliucci, M. 7201656083;6508201009;7006174146; What role does heritable epigenetic variation play in phenotypic evolution? (2010) BioScience, 60 (3), pp. 232-237. https://www.scopus.com/inward/record.uri?eid=2-s2.0-77949533748&doi=10.1525%2fbio.2010.60.3.9&partnerID=40&md5=0d0b2cd70b6143646c b18f384b5ac9e6 DOI: 10.1525/bio.2010.60.3.9 DOCUMENT TYPE: Article

SOURCE: Scopus Johnson, M.K., Wise, D.A. 56134864800;7202543550; The kinetochore moves ahead: contributions of molecular and genetic techniques to our understanding of mitosis (2009) BioScience, 59 (11), pp. 933-943. https://www.scopus.com/inward/record.uri?eid=2-s2.0-77952577863&doi=10.1525%2fbio.2009.59.11.5&partnerID=40&md5=690fff454771ae828 a1c03fa7162d339 DOI: 10.1525/bio.2009.59.11.5 DOCUMENT TYPE: Article SOURCE: Scopus Burton, R.S. 7402130360; Molecular markers, natural history, and conservation of marine animals (2009) BioScience, 59 (10), pp. 831-840. https://www.scopus.com/inward/record.uri?eid=2-s2.0-77649219880&doi=10.1525%2fbio.2009.59.10.5&partnerID=40&md5=1dbe30c98334d81cb f91b9fbbf41bc7b DOI: 10.1525/bio.2009.59.10.5 DOCUMENT TYPE: Article SOURCE: Scopus Saade, A., Bowler, C. 56051446700;7006304415; Molecular tools for discovering the secrets of diatoms (2009) BioScience, 59 (9), pp. 757-765. https://www.scopus.com/inward/record.uri?eid=2-s2.0-77649212624&doi=10.1525%2fbio.2009.59.9.7&partnerID=40&md5=208b12866fd1b02ba1 6324f2eaba9d0e DOI: 10.1525/bio.2009.59.9.7 DOCUMENT TYPE: Article SOURCE: Scopus Dick, C.W., Kress, W.J. 35513100200;57213490214; Dissecting tropical plant diversity with forest plots and a molecular toolkit (2009) BioScience, 59 (9), pp. 745-755. https://www.scopus.com/inward/record.uri?eid=2-s2.0-72249107426&doi=10.1525%2fbio.2009.59.9.6&partnerID=40&md5=47abe69386ac4e83b8 8d0e179512026c DOI: 10.1525/bio.2009.59.9.6 DOCUMENT TYPE: Article SOURCE: Scopus Mothersill, C.E., Smith, R.W., Seymour, C.B. 7005551101;55727432700;7005926808; Molecular tools and the biology of low-dose effects (2009) BioScience, 59 (8), pp. 649-655.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-70149095503&doi=10.1525%2fbio.2009.59.8.6&partnerID=40&md5=076339ab35d9b0295f 10875facba18f4 DOI: 10.1525/bio.2009.59.8.6 DOCUMENT TYPE: Article SOURCE: Scopus Storfer, A., Eastman, J.M., Spear, S.F. 6603789071;15841674900;8528734400; Modern molecular methods for amphibian conservation (2009) BioScience, 59 (7), pp. 559-571. https://www.scopus.com/inward/record.uri?eid=2-s2.0-68949162941&doi=10.1525%2fbio.2009.59.7.7&partnerID=40&md5=0b22caeb412153148c f49175bfc3eb4f DOI: 10.1525/bio.2009.59.7.7 DOCUMENT TYPE: Article SOURCE: Scopus Hughes, J.M., Schmidt, D.J., Finn, D.S. 7404719123;25227009000;7102037674; Genes in streams: Using DNA to understand the movement of freshwater fauna and their riverine habitat (2009) BioScience, 59 (7), pp. 573-583. https://www.scopus.com/inward/record.uri?eid=2-s2.0-68949140687&doi=10.1525%2fbio.2009.59.7.8&partnerID=40&md5=4742d1d5b3c891b651 fc07506202e8bf DOI: 10.1525/bio.2009.59.7.8 DOCUMENT TYPE: Article SOURCE: Scopus Tekle, Y.I., Parfrey, L.W., Katz, L.A. 6506847949;14020125500;56241339200; Molecular data are transforming hypotheses on the origin and diversification of eukaryotes (2009) BioScience, 59 (6), pp. 471-481. https://www.scopus.com/inward/record.uri?eid=2-s2.0-68949157157&doi=10.1525%2fbio.2009.59.6.5&partnerID=40&md5=a6e9a662eba81959f9 3a39c4babfb770 DOI: 10.1525/bio.2009.59.6.5 DOCUMENT TYPE: Article SOURCE: Scopus Caron, D.A. 8446137600; New accomplishments and approaches for assessing protistan diversity and ecology in natural ecosystems (2009) BioScience, 59 (4), pp. 287-299. https://www.scopus.com/inward/record.uri?eid=2-s2.0-67649791192&doi=10.1525%2fbio.2009.59.4.7&partnerID=40&md5=5e1df30d1e6dc7365f 31e8e6828520b0 DOI: 10.1525/bio.2009.59.4.7 DOCUMENT TYPE: Article

Paper 5.A.y. (pages 197-349)

SOURCE: Scopus Tranel, P.J., Horvath, D.P. 55882806600;7103333634; Molecular biology and genomics: New tools for weed science (2009) BioScience, 59 (3), pp. 207-215. https://www.scopus.com/inward/record.uri?eid=2-s2.0-67649801172&doi=10.1525%2fbio.2009.59.3.5&partnerID=40&md5=be72de9ac3652b808f b8dd740c2202ba DOI: 10.1525/bio.2009.59.3.5 DOCUMENT TYPE: Article SOURCE: Scopus Sanders, H.L., Wyatt, S.E. 16417959600;7005406695; Leaf evolution and development: Advancing technologies, advancing understanding (2009) BioScience, 59 (1), pp. 17-26. https://www.scopus.com/inward/record.uri?eid=2-s2.0-63449126596&doi=10.1525%2fbio.2009.59.1.6&partnerID=40&md5=7744153a2f95ab6e75 b164d4065ddc52 DOI: 10.1525/bio.2009.59.1.6 DOCUMENT TYPE: Article SOURCE: Scopus Carvan III, M.J., Incardona, J.P., Rise, M.L. 6603051210;6602243907;6603755912; Meeting the challenges of aquatic vertebrate ecotoxicology (2008) BioScience, 58 (11), pp. 1015-1025. https://www.scopus.com/inward/record.uri?eid=2-s2.0-57349181499&doi=10.1641%2fB581105&partnerID=40&md5=d115c8fe3daa2aa14d3345bca6 b267f4 DOI: 10.1641/B581105 DOCUMENT TYPE: Review SOURCE: Scopus Emerson, D., Agulto, L., Liu, H., Liu, L. 7102272741;24723588300;37079908700;55574231813; Identifying and characterizing bacteria in an era of genomics and proteomics (2008) BioScience, 58 (10), pp. 925-936. https://www.scopus.com/inward/record.uri?eid=2-s2.0-55549141532&doi=10.1641%2fB581006&partnerID=40&md5=c88ffd72aa22a8469969c82aec 30657c DOI: 10.1641/B581006 DOCUMENT TYPE: Review SOURCE: Scopus Peay, K.G., Kennedy, P.G., Bruns, T.D. 10739827800;55598234300;35578568900; Fungal community ecology: A hybrid beast with a molecular master (2008) BioScience, 58 (9), pp. 799-810.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-53149135089&doi=10.1641%2fB580907&partnerID=40&md5=9e62ce0f1c094ce9835b91c382 63e592 DOI: 10.1641/B580907 DOCUMENT TYPE: Review SOURCE: Scopus Levinton, J.S. 7003874875; The Cambrian explosion: How do we use the evidence? (2008) BioScience, 58 (9), pp. 855-864. https://www.scopus.com/inward/record.uri?eid=2-s2.0-53149133175&doi=10.1641%2fB580912&partnerID=40&md5=bc37a4b3af4c85720d36e76aed 0808c3 DOI: 10.1641/B580912 DOCUMENT TYPE: Review SOURCE: Scopus Cusson, M. 7004536952; The molecular biology toolbox and its use in basic and applied insect science (2008) BioScience, 58 (8), pp. 691-700. https://www.scopus.com/inward/record.uri?eid=2-s2.0-51549091928&doi=10.1641%2fB580806&partnerID=40&md5=4d8a4298336ab2649833f97161 772e4d DOI: 10.1641/B580806 DOCUMENT TYPE: Review SOURCE: Scopus Kerth, G. 6603364975; Causes and consequences of sociality in bats (2008) BioScience, 58 (8), pp. 737-746. https://www.scopus.com/inward/record.uri?eid=2-s2.0-50849131162&doi=10.1641%2fB580810&partnerID=40&md5=b2b4fd817deded3d8883bc1b28 d61418 DOI: 10.1641/B580810 DOCUMENT TYPE: Review SOURCE: Scopus Phillips, M.L. 9841959600; Crime scene genetics: Transforming forensic science through molecular technologies (2008) BioScience, 58 (6), pp. 484-489. https://www.scopus.com/inward/record.uri?eid=2-s2.0-45849096471&doi=10.1641%2fB580604&partnerID=40&md5=001e3cf01d4e34078cdc320a61 4c7fe9 DOI: 10.1641/B580604 DOCUMENT TYPE: Short Survey SOURCE: Scopus

Paper 5.A.y. (pages 197-349)

Moeller, L., Wang, K. 16432880800;8933665200; Engineering with precision: Tools for the new generation of transgenic crops (2008) BioScience, 58 (5), pp. 391-401. https://www.scopus.com/inward/record.uri?eid=2-s2.0-44949247189&doi=10.1641%2fB580506&partnerID=40&md5=f275ab66ade8501a39cf810614 dc63f2 DOI: 10.1641/B580506 DOCUMENT TYPE: Review SOURCE: Scopus Wiens, J.J. 7007159965; Systematics and herpetology in the age of genomics (2008) BioScience, 58 (4), pp. 297-307. https://www.scopus.com/inward/record.uri?eid=2-s2.0-43749098078&doi=10.1641%2fB580405&partnerID=40&md5=838a49f878d176c9ec0f3a855d 195dbe DOI: 10.1641/B580405 DOCUMENT TYPE: Review SOURCE: Scopus Holderegger, R., Wagner, H.H. 7004666031;7404367462; Landscape genetics (2008) BioScience, 58 (3), pp. 199-207. https://www.scopus.com/inward/record.uri?eid=2-s2.0-41649085585&doi=10.1641%2fB580306&partnerID=40&md5=d544dd4518e104a05c2b8b81e6 ef0473 DOI: 10.1641/B580306 DOCUMENT TYPE: Review SOURCE: Scopus Loque, J.B., Bürgmann, H., Robinson, C.T. 23992752100;7006154846;7403375011; Progress in the ecological genetics and biodiversity of freshwater bacteria (2008) BioScience, 58 (2), pp. 103-113. https://www.scopus.com/inward/record.uri?eid=2-s2.0-41649111359&doi=10.1641%2fB580205&partnerID=40&md5=67c87031b21978af276c76a810 275a78 DOI: 10.1641/B580205 DOCUMENT TYPE: Review SOURCE: Scopus Cardon, Z.G., Gray, D.W., Lewis, L.A. 6603681815;7403493507;7402152510; The green algal underground: Evolutionary secrets of desert cells (2008) BioScience, 58 (2), pp. 114-122. https://www.scopus.com/inward/record.uri?eid=2-s2.0-41649087841&doi=10.1641%2fB580206&partnerID=40&md5=ac19d4b35272e553fac05460f3 ff4a25

DOI: 10.1641/B580206

DOCUMENT TYPE: Review SOURCE: Scopus Schoen, D.J., Reichman, J.R., Ellstrand, N.C. 7004411069;7005915670;7003511838; Transgene escape monitoring, population genetics, and the law (2008) BioScience, 58 (1), pp. 71-77. https://www.scopus.com/inward/record.uri?eid=2-s2.0-38749131920&doi=10.1641%2fB580112&partnerID=40&md5=29f2202358a7adb5fa27ae73cd f6b6d8 DOI: 10.1641/B580112 DOCUMENT TYPE: Review SOURCE: Scopus Wilsen, K.L., Hepler, P.K. 8545051100;7005287123; Sperm delivery in flowering plants: The control of pollen tube growth (2007) BioScience, 57 (10), pp. 835-844. https://www.scopus.com/inward/record.uri?eid=2-s2.0-36148936774&doi=10.1641%2fB571006&partnerID=40&md5=ebe0d8bb2b83a3732b95923b3b dbf0a6 DOI: 10.1641/B571006 DOCUMENT TYPE: Review SOURCE: Scopus Cheesman, K., French, D., Cheesman, I., Swails, N., Thomas, J. 6602575208;36957581200;16479640500;16481368200;56170135400; Is there any common curriculum for undergraduate biology majors in the 21st century? (2007) BioScience, 57 (6), pp. 516-522. https://www.scopus.com/inward/record.uri?eid=2-s2.0-34250199729&doi=10.1641%2fB570609&partnerID=40&md5=0cf4844c488cb19814878c6cec 2420ba DOI: 10.1641/B570609 DOCUMENT TYPE: Article SOURCE: Scopus Lundmark, C. 22985619000; Molecular adaptations in bacteria (2006) BioScience, 56 (10), p. 872. https://www.scopus.com/inward/record.uri?eid=2-s2.0-33749590567&doi=10.1641%2f0006-3568%282006%2956%5b872%3aMAIB%5d2.0.C0%3b2&partnerID=40&md5=d3ca49e708cc9a35b d2f64b1c7640ad1 DOI: 10.1641/0006-3568(2006)56[872:MAIB]2.0.CO;2 DOCUMENT TYPE: Short Survey SOURCE: Scopus Nobuta, K., Meyers, B.C. 8721759300;7103060543; Pseudomonas versus arabidopsis: Models for genomic research into plant disease resistance

(2005) BioScience, 55 (8), pp. 679-686. https://www.scopus.com/inward/record.uri?eid=2-s2.0-23244457325&doi=10.1641%2f0006-3568%282005%29055%5b0679%3aPVAMFG%5d2.0.C0%3b2&partnerID=40&md5=34a32082e8dd1 f7f7ce99a25230667e3 DOI: 10.1641/0006-3568(2005)055[0679:PVAMFG]2.0.CO;2 DOCUMENT TYPE: Review SOURCE: Scopus Köhler, J., Vieites, D.R., Bonett, R.M., García, F.H., Glaw, F., Steinke, D., Vences, M. 14028673500;6603614913;7801602776;36674983700;7003749433;55901792800;70061295 60; New amphibians and global conservation: A boost in species discoveries in a highly endangered vertebrate group (2005) BioScience, 55 (8), pp. 693-696. https://www.scopus.com/inward/record.uri?eid=2-s2.0-23244432820&doi=10.1641%2f0006-3568%282005%29055%5b0693%3aNAAGCA%5d2.0.C0%3b2&partnerID=40&md5=56ea79167881b 6e7f946c26b3d4d697b DOI: 10.1641/0006-3568(2005)055[0693:NAAGCA]2.0.CO;2 DOCUMENT TYPE: Review SOURCE: Scopus Chornesky, E.A., Bartuska, A.M., Aplet, G.H., Britton, K.O., Cummings-Carlson, J., Davis, F.W., Eskow, J., Gordon, D.R., Gottschalk, K.W., Haack, R.A., Hansen, A.J., Mack, R.N., Rahel, F.J., Shannon, M.A., Wainger, L.A., Wigley, T.B. 6507645395; 6508306776; 6602926929; 7102818928; 8329922600; 26643187300; 8329922800 ;7403582071;7004660306;7004177224;7401928712;7102405291;7003982018;7202548903 ;6603642620;7005591864; Science priorities for reducing the threat of invasive species to sustainable forestry (2005) BioScience, 55 (4), pp. 335-348. https://www.scopus.com/inward/record.uri?eid=2-s2.0-20244382574&doi=10.1641%2f0006-3568%282005%29055%5b0335%3aSPFRTT%5d2.0.C0%3b2&partnerID=40&md5=b9c5a8de6d8db fec48e700c8dcfb0cbb DOI: 10.1641/0006-3568(2005)055[0335:SPFRTT]2.0.CO;2 DOCUMENT TYPE: Article SOURCE: Scopus Galloway, J.N., Aber, J.D., Erisman, J.W., Seitzinger, S.P., Howarth, R.W., Cowling, E.B., Cosby, B.J. 7203012532;7007157171;7006432374;7004252268;7101808753;7004213761;7006623936; The nitrogen cascade (2003) BioScience, 53 (4), pp. 341-356. https://www.scopus.com/inward/record.uri?eid=2-s2.0-0037389818&doi=10.1641%2f0006-3568%282003%29053%5b0341%3aTNC%5d2.0.C0%3b2&partnerID=40&md5=e70e469e5e2eb622 929f44dacb7d29b2 DOI: 10.1641/0006-3568(2003)053[0341:TNC]2.0.CO;2

DOCUMENT TYPE: Review

SOURCE: Scopus Avise, J.C. 7006157182; The best and the worst of times for evolutionary biology (2003) BioScience, 53 (3), pp. 247-255. https://www.scopus.com/inward/record.uri?eid=2-s2.0-0037334285&doi=10.1641%2f0006-3568%282003%29053%5b0247%3aTBATW0%5d2.0.C0%3b2&partnerID=40&md5=da9556ef0a025 4a36715feb216cbf5ec DOI: 10.1641/0006-3568(2003)053[0247:TBATWO]2.0.CO;2 DOCUMENT TYPE: Review SOURCE: Scopus Wu, R., Ma, C.-X., Lou, X.-Y., Casella, G. 7402944700;7402925165;7103370283;11041938000; Molecular Dissection of Allometry, Ontogeny, and Plasticity: A Genomic View of Developmental Biology (2003) BioScience, 53 (11), pp. 1041-1047. https://www.scopus.com/inward/record.uri?eid=2-s2.0-0345016424&doi=10.1641%2f0006-3568%282003%29053%5b1041%3aMDOAOA%5d2.0.C0%3b2&partnerID=40&md5=f4485f2312e76 a96918214fd1b3a56cb DOI: 10.1641/0006-3568(2003)053[1041:MDOAOA]2.0.CO;2 DOCUMENT TYPE: Review SOURCE: Scopus Ben-Ari, E.T. 7004516973; Molecular biographies: Anthropological geneticists are using the genome to decode human history (1999) BioScience, 49 (2), pp. 98-103. https://www.scopus.com/inward/record.uri?eid=2-s2.0-0033044556&doi=10.2307%2f1313533&partnerID=40&md5=82493e2038ba56e8641b1159898 5c0fe DOI: 10.2307/1313533 DOCUMENT TYPE: Review SOURCE: Scopus Boyer, B.B., Barnes, B.M. 7103029852;7102826228; Molecular and metabolic aspects of mammalian hibernation (1999) BioScience, 49 (9), pp. 713-724. https://www.scopus.com/inward/record.uri?eid=2-s2.0-0032854730&doi=10.2307%2f1313595&partnerID=40&md5=677745332258f44e432f8d6e4f2 eadcf DOI: 10.2307/1313595 DOCUMENT TYPE: Article SOURCE: Scopus McKinnell, R.G., Di Berardino, M.A. 7004250899;6602075010; The biology of cloning: History and rationale

(1999) BioScience, 49 (11), pp. 875-885. https://www.scopus.com/inward/record.uri?eid=2-s2.0-0032701035&doi=10.2307%2f1313647&partnerID=40&md5=9418bd3fa197430b3a3caeb804c 0c135 DOI: 10.2307/1313647 DOCUMENT TYPE: Article SOURCE: Scopus Goodman, B. 7102151246; Where ice isn't nice: How the icefish got its antifreeze and other tales of molecular evolution (1998) BioScience, 48 (8), pp. 586-590. https://www.scopus.com/inward/record.uri?eid=2-s2.0-0031826338&doi=10.2307%2f1313417&partnerID=40&md5=dd99d488a498b67bfeebf0393e9 d7c47 DOI: 10.2307/1313417 DOCUMENT TYPE: Review SOURCE: Scopus Bralley, P. 6602896267; An introduction to molecular linguistics (1996) BioScience, 46 (2), pp. 146-153. https://www.scopus.com/inward/record.uri?eid=2-s2.0-4243082283&doi=10.2307%2f1312817&partnerID=40&md5=d09660caf457aa10d2e1399166f 32e82 DOI: 10.2307/1312817 DOCUMENT TYPE: Article SOURCE: Scopus Davis, J.I. 7405965351; Phylogenetics, molecular variation, and species concepts (1996) BioScience, 46 (7), pp. 502-511. https://www.scopus.com/inward/record.uri?eid=2-s2.0-0029741685&doi=10.2307%2f1312928&partnerID=40&md5=ebc749f75205151b82625f62aba 746c1 DOI: 10.2307/1312928 DOCUMENT TYPE: Article SOURCE: Scopus Lewis, R. 57213746099; A new place for fungi? Molecular evolution studies suggest fungi should be taxonomically transposed (1994) BioScience, 44 (6), pp. 389-391. https://www.scopus.com/inward/record.uri?eid=2-s2.0-0027975099&doi=10.2307%2f1312361&partnerID=40&md5=0563e306369a0ed41c396460e9e e6b21 DOI: 10.2307/1312361 DOCUMENT TYPE: Article

SOURCE: Scopus Hart, S. 7202601004; Test-tube survival of the molecularly fit (1993) BioScience, 43 (11), pp. 738-741. https://www.scopus.com/inward/record.uri?eid=2-s2.0-0027134413 & doi = 10.2307 & 2f1312317 & partnerID = 40 & md5 = 01d6093 ceb69 adc7 a 3 ab 9096105 do 2000 a 20006d782 DOI: 10.2307/1312317 DOCUMENT TYPE: Article SOURCE: Scopus Green, D.E., Blondin, G.A. 7404385669;7006556819; Molecular mechanism of mitochondrial energy coupling. (1978) Bioscience, 28 (1), pp. 18-24. https://www.scopus.com/inward/record.uri?eid=2-s2.0-0017925280&doi=10.2307%2f1307482&partnerID=40&md5=34a0a926e5c4f780642c511a1a3 ba5cb DOI: 10.2307/1307482

DOCUMENT TYPE: Review SOURCE: Scopus