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SFU OFFICE OF THE ASSOCIATE VICE-PRESIDENT, ACADEMIC

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MEMORANDUM

ATTENTION	Senate	DATE	January 10, 2020
FROM	Wade Parkhouse, Chair Senate Committee on Undergraduate Studies	PAGES	1/1
RE:	New Course Proposals (SCUS 19-71)		

For information:

Acting under delegated authority at its meeting of January 9, 2020 SCUS approved the following curriculum revisions effective Fall 2020.

a. Faculty of Science (SCUS 20-02)

1. Department of Mathematics

(i) New Course Proposals:

- MATH 426- 3, Probability
- MATH 450- 3, Introduction to topology
- MATH 475-3, Mathematical Topics in Data Science

Senators wishing to consult a more detailed report of curriculum revisions may do so on the Senate Docushare repository at https://docushare.sfu.ca/dsweb/View/Collection-12682.

SFU SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL
1 OF 4 PAGES

COURSE SUBJECT MATH **NUMBER** 426

COURSE TITLE LONG — for Calendar/schedule, no more than 100 characters including spaces and punctuation

Probability

COURSE TITLE SHORT — for enrollment/transcript, no more than 30 characters including spaces and punctuation

Probability

CAMPUS where course will be normally taught: ☑ Burnaby ☐ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

COURSE DESCRIPTION — 50 words max. Attach a course outline. Don't include WQB or prerequisites info in this description box.

An introduction to probability from the rigorous point of view. Random variables. Generating functions. Convergence of random variables. The strong law of large numbers and the central limit theorem. Stochastic processes. Stationary process and martingales.

REPEAT FOR CREDIT ☐ YES ☑ NO Total completions allowed ☐ Within a term? ☐ YES ☐ NO

LIBRARY RESOURCES

NOTE: Senate has approved (S.93-11) that no new course should be approved by Senate until funding has been committed for necessary library materials. Each new course proposal must be accompanied by the email that serves as proof of assessment. For more information, please visit www.lib.sfu.ca/about/overview/collections/course-assessments.

RATIONALE FOR INTRODUCTION OF THIS COURSE

Probability is a core topic in modern applied mathematics. It is used in scientific computing, analysis and applications.
Many applied math graduate programs assume an undergraduate couse in this area. We have regularly taught this as a reading class as well as similarly themed topics classes in the past decade. Now that MATH 348 has moved to Bunraby there is even more interest in advanced probability.

SCHEDULING AND ENROLLMENT INFORMATION

Effective term and year (e.g. FALL 2016) Fall 2020

Term in which course will typically be offered ☐ Spring ☐ Summer ☐ Fall

Other *(describe)*

Will this be a required or elective course in the curriculum? ☐ Required ☑ Elective

What is the probable enrollment when offered? Estimate: 30

UNITS

Indicate number of units: 3

Indicate no. of contact hours: 3 Lecture ☐ Seminar ☐ Tutorial ☐ Lab ☐ Other; explain below

OTHER

FACULTY

Which of your present CFL faculty have the expertise to offer this course?

Ben Adcock, Caroline Colijn, Dave Muraki, Nilima Nigam and Paul Tupper.

WQB DESIGNATION

(attach approval from Curriculum Office)

PREREQUISITE AND / OR COREQUISITE

MATH 242 and (MATH 348 or STAT 380)

EQUIVALENT COURSES [For more information on equivalency, see Equivalency Statements under Information about Specific Course components.]

1. SEQUENTIAL COURSE [is not hard coded in the student information management system (SIMS).]

Students who have taken (*place relevant course(s) in the blank below (ex: STAT 100)*) **first** may not then take this course for further credit.

2. ONE-WAY EQUIVALENCY [is not hard coded in SIMS.]

(*Place relevant course(s) in the blank below (ex: STAT 100)*) will be accepted in lieu of this course.

3. TWO-WAY EQUIVALENCY [is hard coded and enforced by SIMS.]

Students with credit for (*place relevant course(s) in the blank below (ex: STAT 100)*) may not take this course for further credit.

Does the partner academic unit agree that this is a two-way equivalency? ☐ YES ☐ NO

Please also have the partner academic unit submit a course change form to update the course equivalency for their course(s).

4. SPECIAL TOPICS PRECLUSION STATEMENT [is not hard coded in SIMS.]

FEES

Are there any proposed student fees associated with this course other than tuition fees? ☐ YES ☑ NO

COURSE – LEVEL EDUCATIONAL GOALS (OPTIONAL)

RESOURCES

List any outstanding resource issues to be addressed prior to implementation: space, laboratory equipment, etc:

OTHER IMPLICATIONS

Final exam required ☑ YES ☐ NO

Criminal Record Check required ☐ YES ☑ NO

OVERLAP CHECK

Checking for overlap is the responsiblity of the Associate Dean.

Each new course proposal must have confirmation of an overlap check completed prior to submission to the Faculty Curriculum Committee.

Name of Originator

JF Williams

SFU SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL

COURSE SUBJECT MATH **NUMBER** 450

COURSE TITLE LONG — for Calendar/schedule, no more than 100 characters including spaces and punctuation

Introduction to topology

COURSE TITLE SHORT — for enrollment/transcript, no more than 30 characters including spaces and punctuation

Introduction to topology

CAMPUS where course will be normally taught: ☑ Burnaby ☐ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

COURSE DESCRIPTION — 50 words max. Attach a course outline. Don't include WQB or prerequisites info in this description box.

Point set topology: definition, continuous maps, homeomorphisms, product and quotient topologies, Hausdorff topologies, connectedness, compactness and compactifications. Algebraic topology: paths, homotopies, fundamental group, universal covering spaces.

REPEAT FOR CREDIT ☐ YES ☑ NO Total completions allowed ☐ Within a term? ☐ YES ☐ NO

LIBRARY RESOURCES

NOTE: Senate has approved (S.93-11) that no new course should be approved by Senate until funding has been committed for necessary library materials. Each new course proposal must be accompanied by the email that serves as proof of assessment. For more information, please visit www.lib.sfu.ca/about/overview/collections/course-assessments.

RATIONALE FOR INTRODUCTION OF THIS COURSE

Topology provides the basis for most of modern mathematics. Its language and fundamental notions pervades disciplines such as analysis, discrete mathematics, dynamical systems and differential equations, number theory, geometry, and algebra. Most mathematics graduate programmes at well-regarded schools have undergraduate topology as a prerequisite.

The mathematics department at Simon Fraser University has made do with offering topology as a special topics course on a biennial basis in 2015, 2017, and 2019, with solid participation and high evaluations from participating students. The time has come to make it a regular offering.

SCHEDULING AND ENROLLMENT INFORMATION

Effective term and year (e.g. FALL 2016) Fall 2020

Term in which course will typically be offered ☐ Spring ☐ Summer ☐ Fall

Other *(describe)*

Will this be a required or elective course in the curriculum? ☐ Required ☐ Elective

What is the probable enrollment when offered? Estimate: 30

UNITS

Indicate number of units: 3

Indicate no. of contact hours: 3 Lecture ☐ Seminar ☐ Tutorial ☐ Lab ☐ Other; explain below

OTHER

FACULTY

Which of your present CFL faculty have the expertise to offer this course?

Tom Archibald, Nils Bruin, Imin Chen, Matt Devos, Luis Goddyn, Nathan Ilten, Nilima Nigam

WQB DESIGNATION

(attach approval from Curriculum Office)

Q

PREREQUISITE AND / OR COREQUISITE

MATH 242 and MATH 340

EQUIVALENT COURSES [For more information on equivalency, see Equivalency Statements under Information about Specific Course components.]

1. SEQUENTIAL COURSE [is not hard coded in the student information management system (SIMS).]

Students who have taken *(place relevant course(s) in the blank below (ex: STAT 100))* **first** may not then take this course for further credit.

2. ONE-WAY EQUIVALENCY [is not hard coded in SIMS.]

(Place relevant course(s) in the blank below (ex: STAT 100)) will be accepted in lieu of this course.

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Students with credit for *(place relevant course(s) in the blank below (ex: STAT 100))* may not take this course for further credit.

Does the partner academic unit agree that this is a two-way equivalency? ☐ YES ☐ NO

Please also have the partner academic unit submit a course change form to update the course equivalency for their course(s).

4. SPECIAL TOPICS PRECLUSION STATEMENT [is not hard coded in SIMS.]

FEES

Are there any proposed student fees associated with this course other than tuition fees? ☐ YES ☑ NO

COURSE – LEVEL EDUCATIONAL GOALS (OPTIONAL)

RESOURCES

List any outstanding resource issues to be addressed prior to implementation: space, laboratory equipment, etc:

OTHER IMPLICATIONS

Final exam required ☑ YES ☐ NO

Criminal Record Check required ☐ YES ☐ NO

OVERLAP CHECK

Checking for overlap is the responsiblity of the Associate Dean.

Each new course proposal must have confirmation of an overlap check completed prior to submission to the Faculty Curriculum Committee.

Name of Originator

JF Williams

SFU SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL

COURSE SUBJECT MATH **NUMBER** 475

COURSE TITLE LONG — for Calendar/schedule, no more than 100 characters including spaces and punctuation

Mathematical Topics in Data Science

COURSE TITLE SHORT — for enrollment/transcript, no more than 30 characters including spaces and punctuation

Mathematical Topics in Data Science

CAMPUS where course will be normally taught: ☑ Burnaby ☐ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

COURSE DESCRIPTION — 50 words max. Attach a course outline. Don't include WQB or prerequisites info in this description box.

An exploration of the mathematics of data science. Analysis of the foundations of algorithms currently used in the field. Potential topics to be covered include: machine learning, compressed sensing, clustering, randomized numerical linear algebra, complex networks and random graph models.

REPEAT FOR CREDIT ☑ YES ☐ NO Total completions allowed 2 Within a term? ☐ YES ☑ NO

LIBRARY RESOURCES

NOTE: Senate has approved (S.93-11) that no new course should be approved by Senate until funding has been committed for necessary library materials. Each new course proposal must be accompanied by the email that serves as proof of assessment. For more information, please visit www.lib.sfu.ca/about/overview/collections/course-assessments.

RATIONALE FOR INTRODUCTION OF THIS COURSE

Data Science is an emerging field at the interface of computer science, mathematics and statistics. We do not have a regular course offering in this are despite the fact that many of our recent graduates have gone on to work in this field. Professors Adcock, Chauve, Colijn and Stacho all develop algorithms used in this field and many others in the department are users of this technology.

The department has recently taught two offerings of Special Topics classes in this field. Due their success we would like to make them permanent.

SCHEDULING AND ENROLLMENT INFORMATION

Effective term and year (e.g. FALL 2016) FALL 2020

Term in which course will typically be offered ☐ Spring ☐ Summer ☑ Fall

Other *(describe)*

Will this be a required or elective course in the curriculum? ☐ Required ☑ Elective

What is the probable enrollment when offered? Estimate: 30

UNITS

Indicate number of units: 3

Indicate no. of contact hours: 3 Lecture ☐ Seminar ☐ Tutorial ☐ Lab ☐ Other; explain below

OTHER

FACULTY

Which of your present CFL faculty have the expertise to offer this course?

Ben Adcock, Cedric Chauve, Caroline Colijn, Nilima Nigam, Ladislav Stacho and Paul Tupper.

WQB DESIGNATION

(attach approval from Curriculum Office)

PREREQUISITE AND / OR COREQUISITE

Prerequisite courses: MATH 242, MATH 240 or MATH 232 and STAT 270.

EQUIVALENT COURSES [For more information on equivalency, see Equivalency Statements under Information about Specific Course components.]

1. SEQUENTIAL COURSE [is not hard coded in the student information management system (SIMS).]

Students who have taken (*place relevant course(s) in the blank below (ex: STAT 100)*) **first** may not then take this course for further credit.

2. ONE-WAY EQUIVALENCY [is not hard coded in SIMS.]

(*Place relevant course(s) in the blank below (ex: STAT 100)*) will be accepted in lieu of this course.

3. TWO-WAY EQUIVALENCY [is hard coded and enforced by SIMS.]

Students with credit for (*place relevant course(s) in the blank below (ex: STAT 100)*) may not take this course for further credit.

Does the partner academic unit agree that this is a two-way equivalency? ☐ YES ☐ NO

Please also have the partner academic unit submit a course change form to update the course equivalency for their course(s).

4. SPECIAL TOPICS PRECLUSION STATEMENT [is not hard coded in SIMS.]

FEES

Are there any proposed student fees associated with this course other than tuition fees? ☐ YES ☑ NO

COURSE – LEVEL EDUCATIONAL GOALS (OPTIONAL)

RESOURCES

List any outstanding resource issues to be addressed prior to implementation: space, laboratory equipment, etc:

OTHER IMPLICATIONS

Final exam required ☑ YES ☐ NO

Criminal Record Check required ☐ YES ☑ NO

OVERLAP CHECK

Checking for overlap is the responsiblity of the Associate Dean.

Each new course proposal must have confirmation of an overlap check completed prior to submission to the Faculty Curriculum Committee.

Name of Originator

JF Williams

Good morning,

I've reviewed the proposals for the following courses:

- MATH 426: Probability,
- MATH 450: Introduction to topology, and
- MATH 475: Mathematical Topics in Data Science.

No additional resources will be required to support them.

This email will serve as your record that the Library has conducted the assessment of the proposals as they move through the approval process. Once the courses have been approved by Senate, they will appear on this list: http://www.lib.sfu.ca/about/overview/collections/course-assessments/science

Please let me know if you have any questions.

Best,
Megan

Megan Crouch (she/her/hers)
Collections Librarian
Simon Fraser University Library
Located on the unceded traditional territories of the Coast Salish peoples of the xʷməθkwəy̓əm (Musqueam), Skwxwú7mesh (Squamish), and Səl̓ílwətaɬ (Tsleil-Waututh) Nations

On 11-27-2019, at 2:16 PM, JF Williams <jf_williams@sfu.ca> wrote:
Hello, please find attached three course proposal forms. Sample outlines are included below.

I hope to present these to the Faculty of Science Undergraduate Curriculum Committee on December 5.

Best regards, JF.

Course outline for Probability.

Grading Scheme: Homework: 40%, Midterm: 20%, Final: 40%.

Topics:

1. A rigorous (but non-measure theoretic) review of basic probability.

2. Generating functions and their applications.

3. Convergence of random variables.

4. Random processes.

5. Stationary Processes.

6. Markov Chains (if time permits)

7. Martingales (if time permits).

Text: Probability and Random Processes, by Grimmett and Stirzaker.

We will be going through the chapters in order, going faster over material that is a review of material in earlier courses.

Course outline from a topics course offering on Mathematical Topics in Data Science

Mathematical Topics in Data Science
Outline: Data science is an increasingly important area of academic and nonacademic research. The era of 'big data' promises to transform many aspects of our daily lives. With this in mind, the intention of this course is to explore some of the mathematics of data science. Or more precisely, the mathematical theory that underlies some of the most well-known algorithms in this field. Topics to be covered include: foundations of deep learning, compressed sensing, clustering, dimensionality reduction, matrix completion, randomized numerical linear algebra.

Disclaimer: the aim of this course is the mathematical understanding of these algorithms, rather than their implementation and use. If, for example, your objective is to learn how to design and train a neural network, this course is likely not for you. On the other hand, if you want to begin to understand how such algorithms work and why, then consider taking this course.

Textbook: This course will be based on a selection of readings, which will be provided. There is no textbook.
Grading: Homework problems, class participation, midterm and a final project.
Prerequisites: STAT 270, MATH 242, MATH 232 or 240, programming experience. Or permission of the instructor.

Sample Course outline for Topology.

Topology provides the basis for most of modern mathematics. It studies properties of space that are preserved under continuous deformation. These properties turn out to have far-reaching consequences for geometry, differential equations, number theory, and graph theory. Topics studied in this course include:

* topological spaces and their homeomorphisms,
* metric topologies,
* quotient topologies,
* connectedness,
* compactness,
* product topologies and their properties,
* paths and their homotopies,
* the fundamental group,
* covering spaces and their applications.

Format of the course:

Contact hours: Three hours per week. Students participating in the course will be expected to occasionally present solutions to selected assignment problems from the weekly assignments.

Scoring Formula:
Assignments (best 9 out of 10): 40%
Assignment presentation: 10%
Midterm: 15%
Final examination: 35%

Course text:

Topology, second edition
by James R. Munkres
Pearson, 2000
ISBN 0-13-181629-2

Additional reading:

Algebraic topology.
by Alan Hatcher
Cambridge University Press, Cambridge, 2002.
ISBN: 0-521-79160-X; 0-521-79540-0

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