Items for Approval

1. Approval of Graduands (List to be distributed at the door).

Motion: Move the approval of the graduands (1 Bachelor of Medical Laboratory Science, 85 BSc, 25 BSc Hons, and 5 Certificate in Computer Science) for the 2016 Spring Convocation, and 1 BSc graduand for the Fall 2016 Convocation, with the caveat that the Dean or designate be allowed to remove any names at the Executive of Council that do not meet the required average.

Items for Approval

The Faculty of Science Admissions & Studies Committee has approved the following course changes and offers them for approval.

2.0 Department of Biology

Effective date for Motions 2.1-2.4: 201710

2.1 Motion to change the prerequisite of BIOL 375 (Systems Ecology).

BIOL 375 3:3-0
Systems Ecology
An ecosystem approach to energy flow and nutrient cycling in Saskatchewan prairies, forests and lakes.
*** Prerequisite: BIOL 275, and STAT 160 or STAT 200 and STAT 201 or higher.***

Rationale: STAT 201 is no longer offered. STAT 200 is a prerequisite for any STAT above 200.

2.2 Motion to change the prerequisite of BIOL 376 (Population and Community Ecology).

BIOL 376 3:3-3
Population and Community Ecology
Explores the major processes governing population dynamics, species interactions, and community structure. Emphasizes a quantitative framework for understanding populations and communities using mathematical models and graphical analysis.
*** Prerequisite: BIOL 275, MATH 110 one of MATH 111 or MATH 112, and one of STAT 160 or STAT 200***

Rationale: MATH 111 or MATH 112 better address the calculus requirements of BIOL 376.

2.3 Motion to change the prerequisite of BIOL 380 (Animal Behaviour)

BIOL 380 3:3-3
Animal Behaviour
An evolutionary approach to the study of the behaviour and ecology of individual animals. Compulsory field work for one week before lectures begin.
*** Prerequisite: BIOL 275 and one of STAT 200, STAT 201 or higher or BIOL 344***

Rationale: STAT 201 is no longer offered. STAT 200 is a prerequisite for BIOL 341 and for any STAT above 200.
2.4 Motion to change the prerequisite of BIOL 425 (Ecological Methodology).

BIOL 425  3:3-1
Ecological Methodology
A framework for research investigating ecological patterns and processes in natural populations and communities. Observational and experimental methodologies will be covered to enable the students to develop and test hypotheses. *** Prerequisite: BIOL 275 and one of STAT 200, STAT 201 or higher or BIOL 341. ***

Rationale: STAT 201 is no longer offered. STAT 200 is a prerequisite for BIOL 341 and for any STAT above 200.

Items for Approval

The Faculty of Science Admissions & Studies Committee has approved the following program change and offers it for approval.

3.0 Department of Chemistry and Biochemistry

Effective date for Motions 3.1: 201710

3.1 Motion to replace BIOL 265 with BIOL 378 in the BSc. and BSc. Hons Biochemistry programs.

<table>
<thead>
<tr>
<th>Credit hours</th>
<th>BSc with Biochemistry major, required courses</th>
<th>Student's record of courses completed</th>
<th>16.12.2.1 BSc in Biochemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>BIOC 220</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOC 221</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOC 321</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOC 3xx</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOC 3xx or 4xx</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOC 4xx</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOC 4xx</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOL 100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOL 101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOL 205</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOL 310</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOL 265 or 266 or 378</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOC 305</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>CHEM 104</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>CHEM 105</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>CHEM 140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>CHEM 210</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>CHEM 215 or 250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>CHEM 241</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>MATH 110</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>MATH 111</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>STAT 160</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>PHYS 109 or 111</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>CS 110 or 115</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Credit hours</th>
<th>Honours BSc Biochemistry major, required courses</th>
<th>Student's record of courses completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>BIOC 220</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOC 221</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOC 321</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOC 3xx</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOC 3xx or 4xx</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOC 401</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOC 402</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOC 4xx</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOL 100</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOL 101</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOL 205</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOL 265 or 266 or 378</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>BIOC 305</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>CHEM 104</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>CHEM 105</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>CHEM 140</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>CHEM 210</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>CHEM 215 or 250</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>CHEM 241</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>MATH 110</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>MATH 111</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>STAT 160</td>
<td></td>
</tr>
<tr>
<td>Subtotal: Major Requirements</td>
<td>65% Major GPA required</td>
<td></td>
</tr>
<tr>
<td>------------------------------</td>
<td>------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.0 PHYS 109 or 111</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.0 CS 110 or 115</td>
<td></td>
</tr>
<tr>
<td>81.0 Subtotal: Major Requirements</td>
<td>75% Major GPA required</td>
<td></td>
</tr>
</tbody>
</table>

**Rationale:** The department of Biology has changed their animal physiology course from a 2nd year to a third year course (BIOL 265 changed to BIOL 378). Our current BIOC programs offer students a choice between BIOL 265 (animal physiology) and BIOL 266 (plant physiology). This change would maintain this choice.

**Items for Approval**

The Faculty of Science Admissions & Studies Committee has approved the following course changes and offers them for approval.

3.0 **Department of Chemistry and Biochemistry**

**Effective date for Motions 3.2: 201710**

3.2 **Motion** to update the course description of BIOC 391 (Research Experience) and CHEM 391 (Research Experience) as follows.

BIOC 391 3:3-0
Research Experience
This course is intended for students who wish to gain experience in biochemical research under the supervision of a Biochemistry/Chemistry faculty member or a Biochemistry professor at a Federated College. Students will carry out an independent research project, and will have an opportunity to develop an appreciation for experimental preparation, methods, analysis, and scientific report writing.

***Prerequisite: Permission of the Chemistry/Biochemistry Department Head and the faculty member***
*Note: Research positions are limited. Students with a strong background in courses in the subdiscipline of research interest will be given preference*
*Note: Students can only receive credit for one of BIOC 391 and CHEM 391*
*Note: Students can use this course in their program as an elective only*

CHEM 391 3:3-0
Research Experience
This course is intended for students who wish to gain experience in chemical research under the supervision of a Chemistry/Biochemistry faculty member or a Chemistry professor at a Federated College. Students will carry out an independent research project, and will have an opportunity to develop an appreciation for experimental preparation, methods, analysis, and scientific report writing.

***Prerequisite: Permission of the Chemistry/Biochemistry Department Head and the faculty member***
*Note: Research positions are limited. Students with a strong background in courses in the subdiscipline of research interest will be given preference*
*Note: Students can only receive credit for one of CHEM 391 and BIOC 391*
*Note: Students can use this course in their program as an elective only*

**Rationale:** This change is being made to support research programs of science faculty at the federated colleges, and to provide science students, particularly at First Nations University, an opportunity to participate in research.

Note that language has been added to the prerequisite to clarify that the Chem/Bioc head, not the department head at the Federated College, must grant permission to register in this course.
Items for Approval

The Faculty of Science Admissions & Studies Committee has approved the following course change and offers it for approval.

3.0 Department of Chemistry and Biochemistry

Effective date for Motions 3.3: 201710

3.3 Motion to update the prerequisite of CHEM 215 (Analytical Chemistry II).

CHEM 215 3:3-3
Analytical Chemistry II - Spectrochemical Analysis
Spectroscopic methods for structural characterization of organic and inorganic compounds: symmetry, infrared spectroscopy, mass spectrometry, nuclear magnetic resonance, and ultraviolet-visible spectroscopy. This course will emphasize practical aspects of spectroscopic methods. Lab component: Experimental spectroscopic techniques, spectral interpretation, and compound characterization.
***Prerequisite: CHEM 105 and CHEM 140***

Rationale: This motion corrects an error that was introduced into the academic calendar in 2013 during other changes to the course description.

Items for Approval

The Faculty of Science Admissions & Studies Committee has approved the following course changes and offers them for approval.

4.0 Department of Mathematics and Statistics

Effective date for Motions 4.1: 201710

4.1 Motion to archive MATH 232 (Non-Euclidean Geometry), MATH 332 (Topics in Geometry), MATH 383 (Special Functions), MATH 483 (Fourier Series), MATH 484 (Calculus of Variations), and MATH 486 (Applied Analysis I).

Math 232 3:3-0
Non-Euclidean Geometry
This course gives an explanation of the nature and foundations of geometry using the system of non-Euclidean geometry. It outlines the concept of mathematical models and the historical and logical significance of the parallel postulate.
***Prerequisite: Two university mathematics courses and either 70% in Mathematics C30 or Precalculus 30***

Rationale: Several years ago MATH 232 was changed to MATH 331; it is the same course but at a 300 level. The department planned to remove it after a transition period, now is that time.

Math 332 3:3-0
Topics in Geometry
This course explores the relationship of geometry to other fields of mathematics (such as logic and algebra), or to computer science.
***Prerequisite: MATH 122 with a grade of at least 60% and at least 70% in high school geometry***

Rationale: MATH 332 was last taught by Chris Fisher and has not been offered for 5 years.
Math 383 3:3-0
Special Functions
The Gamma and Beta functions, asymptotic series, the hypergeometric functions, Bessel functions, orthogonal polynomials.
*** Prerequisite: MATH 217 with a minimum grade of 60% ***

Rationale: This course has not been offered in several years.

Math 483 3:3-0
Fourier Series
Weierstrass Approximation Theorems; mean-square approximation, summability and convergence theorems. Gibbs' phenomenon, applications.
*** Prerequisite: MATH 305 and 383 with minimum grades of 60% ***

Rationale: This course has not been offered in several years.

Math 484 3:3-0
Calculus of Variations
The brachistochrone, the Euler-Lagrange equations, Hamilton's Principles, isoperimetric problems and min-max problems.
*** Prerequisite: MATH 305 and 481 with minimum grades of 60% ***

Rationale: This course has not been offered in several years.

Math 486 3:3-0
Applied Analysis I
Topics include vector integral theorems, differential equations, Fourier series, Laplace transforms and functions of a complex variable.
*** Prerequisite: MATH 212 and 213 with minimum grades of 60% ***
* Note: This course is intended for beginning graduate students in engineering. It is open to mathematics students with permission of the Department Head. *

Rationale: This course has not been offered in several years.

Items for Approval

The Faculty of Science Admissions & Studies Committee has approved the following course changes and offers them for approval.

4.2 Motion to add a one hour lab to MATH 103, MATH 112, and STAT 160.

Effective date for Motions 4.2: 201730

MATH 103 3:3-0 1
Applied Calculus I
Differentiation of algebraic, exponential, and logarithmic functions. Optimization, curve sketching, and integration by substitution.
*** Prerequisite: Precalculus 30 or Mathematics B30 with a grade of at least 65% or AMTH 092 with a grade of at least 80%, or Math102 ***
*Note: Although Math 103 leads to Math 112, students who require three or more calculus-based courses should take Math 110 instead of Math 103. Students will only receive credit for one of MATH 103 or 110*

MATH 112 3:3-0 1
Applied Calculus II
An introduction to calculus in two and three variables, first-order differential equations, infinite series, and calculus of trigonometric functions.
***Prerequisites: MATH 103 and Precalculus 30, or MATH 110***
*Note: MATH 112 is a terminal course and is not intended for students who require further calculus courses. Students will receive credit for only one of MATH 111 and 112*

Stat 160  
Introductory Statistics  
A comprehensive introduction to probability, probability distributions, sampling distributions, basic techniques of statistical inference, analysis of variance, linear regression, inference for categorical variables, and nonparametric statistics. ***Prerequisite: Precalculus 30, or MATH B30 and MATH C30, or MATH 127***  
*Note: STAT 160 is designed to provide a comprehensive single semester introduction to statistical techniques and is intended for students majoring in statistics, actuarial science, or any other program requiring a detailed knowledge of statistics. Students who receive credit for STAT 160 may not receive credit for STAT 100 or STAT 200*

Rationale: The students in these classes tend to struggle with the course material and would benefit from more contact time. This lab will be run similar to the lab for MATH 110 and 111. Course instructors may choose to give quizzes or tests in this lab.

**Items for Approval**

The Faculty of Science Admissions & Studies Committee has approved the following course changes and offers them for approval.

4.0 Department of Mathematics and Statistics

**Effective date for Motions 4.2: 201710**

4.3 **Motion** to remove the prerequisite of “with grades of at least 60%” from all applicable Math, Stat and Actuarial Science courses.

ACSC 116  
Mathematics of Finance I  
This course provides a basis of financial mathematics. Topics include measurement of interest, basic and general annuities, yield rates, amortization schedules, and sinking funds.  
***Prerequisite: MATH 103 or 105 or 110 with a grade of at least 60%***

ACSC 216  
Mathematics of Finance II  
This course is a continuation of Mathematics of Finance I and covers more advanced topics ranging from the theory of interest to principles of corporate finance. Specific topics include bonds, securities, analysis of risk and basic principles of pricing theory.  
***Prerequisite: ACSC 116 with a grade of at least 60%***

ACSC 217  
Introduction to Actuarial Mathematics  
Topics include: economics of insurance, applications of probability to problems of life insurance, life annuities, and life tables.  
***Prerequisite: ACSC 116, and STAT 251 or 351 with a grade of at least 60%***

ACSC 316  
Mathematics of Finance III  
This course covers the theory and pricing of financial derivatives such as Puts and Calls, with particular emphasis on the Black-Scholes model.  
***Prerequisite: ACSC 216 and STAT 251 with a grade of at least 60%***
ACSC 317    3:3-1
Actuarial Models I
Probabilistic and deterministic contingency mathematics in life insurance and pensions. Topics include: benefit premiums, benefit reserves, multiple life functions, and multiple decrement models.
*** Prerequisite: ACSC 217 with a grade of at least 60% ***

ACSC 318    3:3-0
Actuarial Models II
This course introduces collective risk models over an extended period. Stochastic processes are introduced, followed by definition and application of Markov chains. Introductory loss model material is also presented.
*** Prerequisite: ACSC 317 with a grade of at least 60% ***

ACSC 417    3:3-0
Introduction to Casualty Insurance and Credibility
An introduction to property/casualty loss reserving techniques. Topics include: reserves in casualty insurance, ratemaking process, credibility, and ruin theory.
*** Prerequisite: ACSC 317 with a grade of at least 60% ***

ACSC 419    3:3-0
Estimation and Selection of Actuarial Models
Topics will include: individual risk models for a short term, collective risk models for a single period, and extended period, application of risk theory.
*** Prerequisite: ACSC 318 and STAT 351 with a grade of at least 60% ***

ACSC 456    3:3-0
Applied Stochastic Processes
An introduction to stochastic processes; Markov chains; Poisson processes; renewal processes; Brownian motion; simulation.
*** Prerequisite: STAT 351 with a grade of at least 60% ***
* Note: Credit can be earned for only one of STAT 456 and ACSC 456.*

MATH 116    3:3-0
Mathematics of Finance I
This course provides a basis of financial mathematics. Topics include measurement of interest, basic and general annuities, yield rates, amortization schedules, and sinking funds.
***Prerequisite: MATH 103 or 105 or 110 with a grade of at least 60% ***
*Note: Students can receive credit for only one of Math 116 and ACSC 116*

MATH 216    3:3-0
Mathematics of Finance II
This course is a continuation of Mathematics of Finance I and covers more advanced topics ranging from the theory of interest to principles of corporate finance. Specific topics include bonds, securities, analysis of risk and basic principles of pricing theory.
***Prerequisite: ACSC 116 with a grade of at least 60% ***
*Note: Students can receive credit for only one of Math 216 and ACSC 216*

MATH 300    3:3-0
Introduction to Set Theory
**Prerequisite: MATH 221 and two other university Mathematics courses with grades of at least 60%.**

**MATH 301**
Introduction to Mathematical Logic
Propositional and first-order predicate logic from a mathematical viewpoint. Axiomatically built theories and their models. Detailed study of one or more simple mathematical theories. Recursive functions. Basic ideas of automated theorem proving.

**Prerequisite: MATH 221 and 223 with grades of at least 60%**

**MATH 305**
Introductory Mathematical Analysis
Cardinality, real numbers and their topology, sequences, limits, continuity, and differentiation for functions of one real variable.

**Prerequisite: MATH 221 and 111 with grades of at least 60%**

*Note: This course is designed for students interested in majoring in Mathematics. Students considering a degree in Mathematics with Honours are encouraged to complete this course by the end of their second year*

**MATH 308**
Topics in the History of Mathematics
A survey of the history of Mathematics exploring the biographies, philosophies and techniques of great mathematicians. The course is directed specifically at Mathematics majors and Secondary Math Education students.

**Prerequisite: MATH 111, 122, and 221 with grades of at least 60%**

**MATH 312**
Complex Analysis I
Complex numbers, analytic functions, contour integration, Cauchy's theorem, infinite series, calculus of residues, basic theory of conformal mappings.

**Prerequisite: MATH 213 with a grade of at least 60%**

**MATH 313**
Mathematical Analysis II
The Riemann integral for functions of one variable, sequences and series of functions, differentiation and integration for functions of several variables.

**Prerequisites: Math 213 and Math 305 with grades of at least 60%**

**MATH 316**
Mathematics of Finance III
This course covers the theory and pricing of financial derivatives such as Puts and Calls, with particular emphasis on the Black-Scholes model.

**Prerequisite: ACSC 216 and STAT 251 with a grade of at least 60%**

*Note: Students can receive credit for only one of Math 316 and ACSC 316*

**MATH 317**
Real Analysis I
Construction of the real numbers, structure of metric spaces, continuous functions on metric spaces, convergence of series, differential equations.

**Prerequisite: MATH 217 and 313 with grades of at least 60%**
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
<th>Description</th>
<th>Prerequisite Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 321</td>
<td>3:3-0</td>
<td>Number Theory I</td>
<td>This is an introductory course in number theory. Topics include divisibility, primes, congruences, number theoretic functions, and diophantine equations.</td>
<td>*** Prerequisite: MATH 221 and two other university mathematics courses with grades of at least 60% ***</td>
</tr>
<tr>
<td>MATH 322</td>
<td>3:3-0</td>
<td>Matrix Theory</td>
<td>Topics include: positive definiteness, Jordan canonical form, nonnegative matrices, and applications in matrix analysis.</td>
<td>*** Prerequisite: MATH 222 with a grade of at least 60% ***</td>
</tr>
<tr>
<td>MATH 323</td>
<td>3:3-0</td>
<td>Modern Algebra I</td>
<td>A course in abstract algebra dealing with groups, rings, unique factorization domains and fields.</td>
<td>*** Prerequisite: MATH 223 with a grade of at least 60% ***</td>
</tr>
<tr>
<td>MATH 327</td>
<td>3:3-0</td>
<td>Introductory Combinatorics</td>
<td>This is an introductory course in combinatorics. Topics include permutations and combinations, inclusion and exclusion, generating functions, and a brief introduction to graph theory.</td>
<td>*** Prerequisite: MATH 221 and 111 with grades of at least 60% ***</td>
</tr>
<tr>
<td>MATH 331</td>
<td>3:3-0</td>
<td>Non-Euclidean Geometry</td>
<td>This course gives an explanation of the nature and foundations of geometry and uses for this purpose the systems of non-Euclidean geometry. It outlines the concept of mathematical models and the historical and logical significance of the parallel postulate.</td>
<td>***Prerequisite: Math 110, and one of Math 122 or Math 231, with grades of at least 60% *** <em>Note: Students may receive credit for only one of Math 232 and Math 331</em></td>
</tr>
<tr>
<td>MATH 361</td>
<td>3:3-0</td>
<td>Numerical Analysis I</td>
<td>Least squares and other approximations. Difference equations. Solutions of algebraic systems. Symbol manipulators-Mathematica.</td>
<td>***Prerequisite: MATH 213 and either MATH 261 or CS 261, with minimum grades of at least 60% ***</td>
</tr>
<tr>
<td>MATH 381</td>
<td>3:3-0</td>
<td>Differential Equations II</td>
<td>Series solutions of linear equations, systems of linear first-order equations, Fourier series, boundary-value problems, integral transforms, and numerical methods.</td>
<td>***Prerequisite: MATH 217 with a minimum grade of 60% ***</td>
</tr>
<tr>
<td>MATH 382</td>
<td>3:3-0</td>
<td>Ordinary Differential Equations</td>
<td>Existence and uniqueness of solutions, linear systems, non-linear equations, stability, Liapunov's method, applications.</td>
<td>*** Prerequisite: MATH 217 with a minimum grade of 60% ***</td>
</tr>
</tbody>
</table>
MATH 411    3:3-0  
Real Analysis II  
Measurable functions, Lebesgue integrals, Lp spaces, modes of convergence, signed measures, Radon-Nikodym Theorem.  
***Prerequisite: MATH 313 with a grade of at least 60% ***

MATH 412    3:3-0  
Complex Analysis II  
This is a continuation of MATH 312. Topics include conformal mappings, argument principle, Rouche's theorem, harmonic functions, Riemann Mapping Theorem, infinite products, asymptotic expansions.  
*** Prerequisite: MATH 312 with a grade of at least 60% ***

MATH 421    3:3-0  
Number Theory II  
This course is a second course in number theory. Topics include quadratic reciprocity, arithmetic functions, distribution of primes, and the prime number theorem.  
*** Prerequisite: MATH 321, 305, and 312 with grades of at least 60% ***

MATH 422    3:3-0  
Abstract Linear Algebra  
A course which presents linear algebra in a theoretical setting. Topics include vector spaces, dual spaces, linear transformations, Jordan canonical form, the spectral theorem, and selected topics.  
*** Prerequisite: MATH 222 and 323, with grades of at least 60% or MATH 222 and permission of the instructor. ***

MATH 423    3:3-0  
Modern Algebra II  
Continuation of Modern Algebra I with further study of rings, groups and fields.  
*** Prerequisite: MATH 323 with a grade of at least 60% ***

MATH 424    3:3-0  
Applied Algebra  
This is a course in applications of algebra to a selection of topics concerning enumeration, coding, finite state machines and cryptography.  
*** Prerequisite: MATH 223 or 323 with a grade of at least 60% ***

MATH 427    3:3-0  
Graph Theory  
This is the first in-depth course in graph theory. Topics included are connectivity, Euler tours and Hamiltonian cycles, matchings, colouring problems, planarity and network flows. Stress is placed wherever possible on constructive methods of proof.  
*** Prerequisite: MATH 327, or 329, or CS 310, with a grade of at least 60% or permission of Department Head ***

MATH 431    3:3-0  
Differential Geometry I  
Differential invariants of curves and surfaces in Euclidean three-space.  
*** Prerequisite: MATH 217 with a minimum grade of 60% ***
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 432</td>
<td>3:3-0</td>
<td>Differential Geometry II</td>
<td>Continuation of topics covered in Differential Geometry I. *** Prerequisite: MATH 431 with a minimum grade of 60% ***</td>
</tr>
<tr>
<td>MATH 441</td>
<td>3:3-0</td>
<td>General Topology</td>
<td>An introduction to point set topology including separation axioms, compactness, connectedness, continuous functions and metric spaces. <em><strong>Prerequisite: MATH 305 with a minimum grade of 60%</strong></em></td>
</tr>
<tr>
<td>MATH 461</td>
<td>3:3-0</td>
<td>Numerical Analysis II</td>
<td>Numerical solutions of ordinary differential equations; numerical solutions of partial differential equations; linear and non-linear problems. <em><strong>Prerequisite: MATH 361 or CS 361, with a minimum grade of 60%</strong></em></td>
</tr>
<tr>
<td>MATH 481</td>
<td>3:3-0</td>
<td>Partial Differential Equations</td>
<td>Classification and basic properties of equations, separation of variables, Fourier series, Sturm-Liouville theory, Fourier and Laplace transforms. *** Prerequisite: MATH 381 with a minimum grade of 60% ***</td>
</tr>
<tr>
<td>MATH 482</td>
<td>3:3-0</td>
<td>Laplace Transforms</td>
<td>Properties of the Laplace Transform. Convolutions. The inversion integral. Applications to solutions of differential equations. *** Prerequisite: MATH 217 and 312 with minimum grades of 60% ***</td>
</tr>
<tr>
<td>MATH 485</td>
<td>3:3-0</td>
<td>Introduction to Functional Analysis</td>
<td>Metric, normed linear and inner-product spaces, linear operators and fixed point theorems. Spectral decompositions the Stone-Weierstrass theorem, applications. *** Prerequisite: MATH 305 and 312 with grades of at least 60% ***</td>
</tr>
<tr>
<td>STAT 252</td>
<td>3:3-0</td>
<td>Introduction to Statistical Inference</td>
<td>Sampling distribution theory and the Central Limit Theorem; large sample theory; methods of estimation and hypothesis testing including maximum likelihood estimation, likelihood ratio testing, and confidence interval construction. *** Prerequisite: STAT 251 with a grade of at least 60%. ***</td>
</tr>
<tr>
<td>STAT 342</td>
<td>3:3-0</td>
<td>Biostatistics</td>
<td>This course will present relevant, up-to-date coverage of research methodology using careful explanations of basic statistics and how they are used to address practical problems that arise in the medical and public health settings. Through this course, students will learn to interpret and examine data by applying common statistical tools to the biostatistical, medical, and public health fields. *** Prerequisite: STAT 160 or STAT 200 with a grade of at least 60%*** <em>Note: Students with credit in BIOL 341 cannot take STAT 342 for credit.</em></td>
</tr>
</tbody>
</table>
STAT 351  3:3-0
Intermediate Probability
Multivariate random variables; conditioning; order statistics; the multivariate normal distribution; the Poisson process.
*** Prerequisite: MATH 213 and STAT 251 with grades of at least 60% ***

STAT 354  3:3-1
Linear Statistical Models
Simple linear regression; multiple linear regression; diagnostics and remedial measures for regression models; remedial measures and alternative regression techniques; multicollinearity diagnostics.
*** Prerequisite: STAT 252 with a grade of at least 60%, and CS 110 and MATH 122 ***

STAT 357  3:3-1
Sampling Theory
Simple random sampling; systematic sampling; stratified and cluster sampling; ratio and regression estimators.
*** Prerequisite: STAT 252 with a grade of at least 60% and CS 110

STAT 362  3:3-1
Bayesian Statistics
An introduction to Bayesian methods; Bayesian inference for discrete random variables, binomial proportions, and normal means; comparisons between Bayesian and frequentist inferences; robust Bayesian methods.
*** Prerequisite: STAT 252 with a grade of at least 60% and CS 110

STAT 384  3:3-1
Categorical Data Analysis
Odds ratio; two-way and higher-way contingency tables; Chi-squared tests of independence; loglinear and logit models; multinomial response models; models for matched pairs.
*** Prerequisite: STAT 252 with a grade of at least 60% and CS 110.
* Note: It is suggested that students register for STAT 354 concurrently if possible. *

STAT 386  3:3-1
Nonparametric Statistical Methods
Nonparametric statistics for data analysis including rank-based methods, bootstrap methods, and permutation tests; one-sample and two-sample methods; paired comparisons and blocked designs; tests for trends and association; smoothing methods and robust model fitting.
*** Prerequisite: STAT 252 with a grade of at least 60% and CS 110

STAT 426  3:3-0
Survival Analysis
Life tables; survival distributions; types of censoring; estimation of and interface for basic survival quantities; proportional hazards regression model; planning and design of clinical trials.
*** Prerequisite: STAT 351 with a grade of at least 60% ***

STAT 441  3:3-0
Stochastic Calculus with Applications to Finance
Processes derived from Brownian motion; the Ito integral and Ito's formula; applications of Ito's formula in financial modelling, especially within the context of the Black-Scholes option pricing model.
*** Prerequisite: STAT 351 with a grade of at least 60% ***
STAT 451  3:3-0
Advanced Probability
Probability measures; distribution functions; sequences of random variables; characteristic functions; modes of convergence; convergence theorems; weak and strong laws of large numbers; Central Limit Theorem.
*** Prerequisite: STAT 351 with a grade of at least 60% ***

STAT 452  3:3-0
Advanced Statistical Inference
Detailed theoretical development of statistical inference; statistical models; exponential families; sufficiency; completeness; properties of point estimation; testing hypotheses and confidence regions; asymptotic properties of estimators. *** Prerequisite: STAT 351 and STAT 252 with grades of at least 60% ***

STAT 454  3:3-1
Applied Multivariate Analysis
Review of multivariate normal distribution; inferences about a mean vector; multivariate linear regression analysis; principal components; factor analysis; canonical correlation analysis.
*** Prerequisite: STAT 351 and STAT 354 with grades of at least 60% ***

STAT 456  3:3-0
Applied Stochastic Processes
An introduction to stochastic processes; Markov chains; Poisson processes; renewal processes; Brownian motion; simulation.
*** Prerequisite: STAT 351 with a grade of at least 60% ***
* Note: Credit can be earned for only one of STAT 456 and ACSC 456. *

STAT 471  3:3-1
Time Series Analysis
Types of time series; stationarity; autoregressive integrated moving average models; modelling and forecasting; parameter estimation; diagnostic checking; prediction; residual analysis.
*** Prerequisite: STAT 351 and STAT 354 with grades of at least 60% ***

STAT 485  3:3-1
Design and Analysis of Experiments
Theory and application of analysis of variance for standard experimental designs including blocked, nested, factorial, Latin square, and split-plot designs; fixed and random effects; multiple comparisons; analysis of covariance.
*** Prerequisite: STAT 351 and STAT 354 with grades of at least 60% ***

Rationale: This requirement has been causing problems in some classes. It essentially sets two standards for our classes; 50% to pass and 60% to continue to the next level. Most programs also require a minimum average to graduate, so this requirement may be redundant.
Items for Approval

The Faculty of Science Admissions & Studies Committee has approved the following course changes and offers them for approval.

4.0 Department of Mathematics and Statistics

Effective date for Motions 4.2: 201710

4.4 Motion to update prerequisites of MATH 112, MATH 116, MATH 221, MATH 222, MATH 223, MATH 300, MATH 301, MATH 327, MATH 329, MATH 422, MATH 424, MATH 426, MATH 427, and MATH 485, as indicated below.

MATH 112 3:3-1
Applied Calculus II
An introduction to calculus in two and three variables, first-order differential equations, infinite series, and calculus of trigonometric functions.
***Prerequisites: MATH 103 and Precalculus 30, or MATH 110***
*Note: MATH 112 is a terminal course and is not intended for students who require further calculus courses. Students will receive credit for only one of MATH 111 and 112*

MATH 116 3:3-0
Mathematics of Finance I
This course provides a basis of financial mathematics. Topics include measurement of interest, basic and general annuities, yield rates, amortization schedules, and sinking funds.
***Prerequisite: MATH 103 or 105 or 110 with a grade of at least 60%***
*Note: Students can receive credit for only one of Math 116 and ACSC 116*

MATH 221 3:3-0
Introduction to Proofs and Problem Solving
An introductory course intended to familiarize students with mathematical reasoning and proof techniques, including direct reasoning, indirect reasoning, and mathematical induction. Topics include elementary number theory, logic, sets, functions, and relations.
***Prerequisite: MATH 110 and one of MATH 111, 122 or 127 Two university math courses beyond Math 102***

MATH 222 3:3-0
Linear Algebra II
A second course in linear algebra. There will be some emphasis on proofs. Topics include matrices, abstract vector spaces, subspaces, bases, inner product spaces, linear transformations, matrix factorizations, symmetric matrices, quadratic forms, and applications of linear algebra.
*** Prerequisite: MATH 103 or 110, and MATH 122, and one of MATH 103 or 110 ***

MATH 223 3:3-0
Introduction to Abstract Algebra
An introductory course in abstract algebra. Topics include number systems and an introduction to groups, and some other mathematical structures.
*** Prerequisite: One of MATH 110 or 122, and MATH 221 ***

MATH 300 3:3-0
Introduction to Set Theory
MATH 301 3:3-0
Introduction to Mathematical Logic
Propositional and first-order predicate logic from a mathematical viewpoint. Axiomatically built theories and their models. Detailed study of one or more simple mathematical theories. Recursive functions. Basic ideas of automated theorem proving.
*** Prerequisite: MATH 221 and 223 with grades of at least 60% ***

MATH 327 3:3-0
Introductory Combinatorics
This is an introductory course in combinatorics. Topics include permutations and combinations, inclusion and exclusion, generating functions, and a brief introduction to graph theory.
*** Prerequisite: MATH 221 and 111 with grades of at least 60% ***

MATH 329 3:3-1
Linear and Discrete Optimization
A course in the theory and techniques of linear programming; convexity and extreme points of polyhedral sets, the simplex method, duality and selected applications will be covered.
*** Prerequisite: CS 110, MATH 122 and one of MATH 103 or 110, and one of MATH 221 or 222 permission of Department Head ***

MATH 422 3:3-0
Abstract Linear Algebra
A course which presents linear algebra in a theoretical setting. Topics include vector spaces, dual spaces, linear transformations, Jordan canonical form, the spectral theorem, and selected topics.
*** Prerequisite: MATH 222 and 323 with grades of at least 60% or MATH 222 and or permission of the instructor. ***

MATH 424 3:3-0
Applied Algebra
This is a course in applications of algebra to a selection of topics concerning enumeration, coding, finite state machines and cryptography.
*** Prerequisite: MATH 223 or 323 with a grade of at least 60% ***

MATH 426 3:3-0
Combinatorial Matrix Theory
A survey of some of the topics from combinatorial matrix theory including: spectral graph theory and algebraic graph theory.
*** Prerequisite Math 305, 222 and 327***

MATH 427 3:3-0
Graph Theory
This is the first in-depth course in graph theory. Topics included are connectivity, Euler tours and Hamiltonian cycles, matchings, colouring problems, planarity and network flows. Stress is placed wherever possible on constructive methods of proof.
*** Prerequisite: MATH 223 and 327, or 329, or CS 310, with a grade of at least 60% or permission of Department Head. ***
MATH 485  3:3-0
Introduction to Functional Analysis
Metric, normed linear and inner-product spaces, linear operators and fixed point theorems. Spectral decompositions the Stone-Weierstrass theorem, applications.
*** Prerequisite: MATH 305 and 312 and 313 with grades of at least 60%***

Rationale: If we are going to remove the “with grades of at least 60%” for all the prerequisites, we will have to change all the prerequisites anyway, so this is just a good opportunity to update them.

Items for Approval
The Faculty of Science Admissions & Studies Committee has approved the following course changes and offers them for approval.

4.0 Department of Mathematics and Statistics

Effective date for Motions 4.2: 201710

4.5 Motion to update the description of MATH 308 and create MATH 309 (Topics in Modern Mathematics).

MATH 309  3:3-0
Topics in Modern Mathematics
A survey of modern mathematics, examining the objectives of mathematical advancement, important modern results in mathematics, mathematicians of the modern era, and the influences of modern mathematics on contemporary science. The focus of this course will be on mathematics after Gauss (post 1850). The emphasis will be on general modern approaches to mathematical problems and the philosophy of mathematics, rather than specific results. Topics will include (but are not limited to): the nature of mathematical knowledge, origins of modern mathematics, biographies of mathematicians and the influence of mathematics on contemporary science.
*** Prerequisite: MATH 111,122 and 221.***

**Note: This course is designed for majors in mathematics or mathematics education with a solid background in mathematics. **

Rationale: This came forward at a department meeting a few years ago, but it was felt that the syllabus was too vague. The syllabus has been updated to make it clearer.

MATH 308  3:3-0
Topics in the History of Mathematics
A survey of the history of Mathematics exploring the biographies, philosophies and techniques of great mathematicians. The course is directed specifically at Mathematics majors and Secondary Math Education students.
A survey of the history of mathematics, focusing on mathematics developed before 1850. Topics may include mathematics of ancient cultures, cultural aspects of mathematics, how mathematics developed around the world, famous mathematicians and classical mathematics texts. This course is designed for majors in mathematics or mathematics education with a solid background in mathematics. It will be offered in the winter semester, alternating with MATH 309.
*** Prerequisite: MATH 111, 122, and 221 with grades of at least 60% ***

**Note: This course is designed for majors in mathematics or mathematics education with a solid background in mathematics. **

Rationale: If Math 309 is created, then the course description for MATH 308 should be updated.
Items for Approval

The Faculty of Science Admissions & Studies Committee has approved the following course change and offers it for approval.

5.0 Department of Mathematics and Statistics

Effective date for Motions 4.2: 201710

5.6 Motion to update the course description for MATH 427.

MATH 427 3:3-0

Graph Theory
This is the first in-depth course in graph theory. Topics included are connectivity, Euler tours and Hamiltonian cycles, matchings, colouring problems, planarity and network flows. Stress is placed wherever possible on constructive methods of proof.

This course is a survey of topics in graph theory. Topics may include the following: matchings and factorizations, connectivity, colouring, isomorphisms, homomorphisms, automorphism groups and transitive graphs, extremal problems, adjacency matrices, spectral graph theory, strongly regular graphs, Cayley graphs, Ramsey theory and random graphs***

*** Prerequisite: MATH 223 and 327, or 329, or CS 310, with a grade of at least 60% or permission of Department Head***

Rationale: The current description was written for the course that Denis Hanson would teach.