### 1.0 Degree Title
Please specify the two degrees for concurrent degree programs
- Bachelor of Science

### 1.1 Major (Legacy = Subject)(30-char. max.)
- Honours Earth System Science

### 1.2 Concentration (Legacy = Concentration/Option)
If applicable to Majors only (30 char. max.)

### 1.3 Minor (with Concentration, if Applicable) (30 char. max.)

### 2.0 Administering Faculty/Unit
- Science

### 3.0 Effective Term of Implementation
(Ex. Sept. 2004 = 200409)
- Term: 201309

### 4.0 Rationale for new proposal
This new honours program will provide greater choice to advanced undergraduate students at McGill wishing to study Earth System Science. This program will allow the ESS program to grow and flourish.

### 5.0 Program Information
Please check appropriate box(es)

#### 5.1 Program Type
- Bachelor’s Program **X**
- Master’s
- M.Sc. (Applied) Program
- Dual Degree/Concurrent Program
- Certificate
- Diploma
- Graduate Certificate
- Graduate Diploma
- Ph.D. Program
- Doctorate Program (Other than Ph.D.)
- Private Program
- Off-Campus Program
- Distance Education Program (By Correspondence)
- Other (Please specify)

#### 5.2 Category
- Faculty Program (FP)
- Major
- Joint Major
- Major Concentration (CON)
- Minor
- Minor Concentration (CON)
- Honours (HON) **X**
- Joint Honours Component (HC)
- Internship/Co-op
- Thesis (T)
- Non-Thesis (N)
- Other
  - Please specify

#### 5.3 Level
- Undergraduate **X**
- Dentistry/Law/Medicine
- Continuing Ed (Non-Credit)
- Collegial
- Masters & Grad Dips & Certs
- Doctorate
- Post-Graduate Medicine/Dentistry
- Graduate Qualifying
- Postdoctoral Fellows

### 6.0 Total Credits
- 66

### 7.0 Consultation with Related Units
- Yes **X** No

### 7.0 Consultation with Financial Consult
- Yes **X** No

Attach list of consultations.
8.0 Program Description (Maximum 150 words)

The program curriculum is designed to provide a rigorous foundation in earth system science and the flexibility to create an individualized program in preparation for careers in industry, teaching, and research. It is also intended to provide an excellent preparation for graduate work in earth system science. A CGPA of 3.20 or higher is required for registration in and graduation from this program.

9.0 List of proposed program for the New Program/Major or Minor/Concentration.

If new concentration (option) of existing Major/Minor (program), please attach a program layout (list of all courses) of existing Major/Minor.

Proposed program (list courses as follows: Subj Code/Crse Num, Title, Credit weight under the headings of: Required Courses, Complementary Courses, Elective Courses)

### Honours Earth System Science (66 credits)

**Required Courses (33 credits)**
- COMP 202 (3) Introduction to Computing 1
- ENVR 201 (3) Society and Environment
- ESYS 200 (3) Earth System Processes
- ESYS 300 (3) Investigating the Earth System
- ESYS 301 (3) Earth System Modelling
- ESYS 500 (3) Earth Systems Applications
- MATH 203 (3) Principles of Statistics 1 (or equivalent course)
- MATH 222 (3) Calculus 3
- MATH 315 (3) Ordinary Differential Equations
- ESYS 480 (6) Honours Research Project

**Complementary Courses (33 credits)**

One of the following two courses:
- ATOC 214 (3) Introduction: Physics of the Atmosphere
- ATOC 219 (3) Introduction to Atmospheric Chemistry

One of the following two courses:
- EPSC 210 (3) Introductory Mineralogy
- EPSC 220 (3) Principles of Geochemistry

One of the following two courses:
- GEOG 306 (3) Raster Geo-Information Sciences
- GEOG 308 (3) Principles of Remote Sensing

One of the following two courses:
- ENVR 200 (3) The Global Environment
- GEOG 203 (3) Environmental Systems

One of the following two courses:
- BIOL 215 (3) Introduction to Ecology and Evolution
- ENVR 202 (3) The Evolving Earth

See attached…

Attach extra page(s) as needed
Honours Earth System Science (Complementary Courses Continued)

One of the following courses:

ANTH 339 (3) Ecological Anthropology
GEOG 217 (3) Cities in the Modern World
GEOG 221 (3) Environment and Health
GEOG 300 (3) Human Ecology in Geography
GEOG 310 (3) Development and Livelihoods
GEOG 382 (3) Principles of Earth Citizenship
GEOG 406 (3) Human Dimensions of Climate Change

15 credits from the following course list, with at least 3 credits from each of subject codes ATOC, EPSC, and GEOG. At least 9 of the 15 credits must be at the 400 level or higher.

Note: Courses at the 300 level or higher in other departments in the Faculties of Science and Engineering may also be used as complementary credits, with the permission of an academic adviser. Please see the list posted on the Departmental web page.

ATOC 215 (3) Oceans, Weather and Climate
ATOC 309 (3) Weather Radars and Satellites
ATOC 315 (3) Thermodynamics and Convection
ATOC 412 (3) Atmospheric Dynamics
ATOC 419 (3) Advances in Chemistry of Atmosphere
ATOC 512 (3) Atmospheric and Oceanic Dynamics
ATOC 513 (3) Waves and Stability
ATOC 515 (3) Turbulence in Atmosphere and Oceans
ATOC 521 (3) Cloud Physics
ATOC 525 (3) Atmospheric Radiation
ATOC 530 (3) Paleoclimate Dynamics
ATOC 531 (3) Dynamics of Current Climates
ATOC 540 (3) Synoptic Meteorology 1
ATOC 541 (3) Synoptic Meteorology 2
BIOL 308 (3) Ecological Dynamics
BIOL 309 (3) Mathematical Models in Biology
BIOL 310 (3) Biodiversity and Ecosystems
BIOL 432 (3) Limnology
BIOL 434 (3) Theoretical Ecology
BIOL 441 (3) Biological Oceanography
BIOL 465 (3) Conservation Biology
BIOL 540 (3) Ecology of Species Invasions
BIOL 573 (3) Vertebrate Paleontology Field Course
BREE 217 (3) Hydrology and Water Resources
BREE 319 (3) Engineering Mathematics
BREE 509 (3) Hydrologic Systems and Modelling
BREE 510 (3) Watershed Systems Management
BREE 515 (3) Soil Hydrologic Modelling
BREE 533 (3) Water Quality Management
ECON 347 (3) Economics of Climate Change
ECON 405 (3) Natural Resource Economics
EPSC 212 (3) Introductory Petrology
EPSC 312 (3) Spectroscopy of Minerals
EPSC 320 (3) Elementary Earth Physics
EPSC 330 (3) Earthquakes and Earth Structure
EPSC 331 (3) Field School 2
EPSC 340 (3) Earth and Planetary Inference
EPSC 334 (3) Invertebrate Paleontology
EPSC 341 (3) Field School 3
EPSC 350 (3) Tectonics
EPSC 423 (3) Igneous Petrology
EPSC 425 (3) Sediments to Sequences
EPSC 445 (3) Metamorphic Petrology

See attached..
Honours Earth System Science (Complementary Courses Continued)

EPSC 452 (3) Mineral Deposits
EPSC 455 (3) Sedimentary Geology
EPSC 519 (3) Isotope Geology
EPSC 530 (3) Volcanology
EPSC 542 (3) Chemical Oceanography
EPSC 549 (3) Hydrogeology
EPSC 561 (3) Ore-forming Processes 1
EPSC 580 (3) Aqueous Geochemistry
EPSC 590 (3) Applied Geochemistry Seminar
GEOG 272 (3) Earth's Changing Surface
GEOG 305 (3) Soils and Environment
GEOG 307 (3) Socioeconomic Applications of GIS
GEOG 321 (3) Climatic Environments
GEOG 322 (3) Environmental Hydrology
GEOG 350 (3) Ecological Biogeography
GEOG 351 (3) Quantitative Methods
GEOG 372 (3) Running Water Environments
GEOG 470 (3) Wetlands
GEOG 495 (3) Field Studies - Physical Geography
GEOG 499 (3) Subarctic Field Studies
GEOG 501 (3) Modelling Environmental Systems
GEOG 505 (3) Global Biogeochemistry
GEOG 506 (3) Advanced Geographic Information Science
GEOG 523 (3) Global Ecosystems and Climate
GEOG 530 (3) Global Land and Water Resources
GEOG 535 (3) Remote Sensing and Interpretation
GEOG 536 (3) Geocryology
GEOG 537 (3) Advanced Fluvial Geomorphology
GEOG 550 (3) Historical Ecology Techniques
MATH 314 (3) Advanced Calculus
MATH 315 (3) Ordinary Differential Equations (see note below)
MATH 317 (3) Numerical Analysis
MATH 319 (3) Introduction to Partial Differential Equations
MATH 323 (3) Probability
MATH 326 (3) Nonlinear Dynamics and Chaos
MATH 423 (3) Regression and Analysis of Variance
MATH 437 (3) Mathematical Methods in Biology
MATH 447 (3) Introduction to Stochastic Processes
MATH 525 (4) Sampling Theory and Applications
NRSC 540 (3) Socio-Cultural Issues in Water
PHYS 331 (3) Topics in Classical Mechanics
PHYS 340 (3) Majors Electricity and Magnetism
PHYS 342 (3) Majors Electromagnetic Waves
PHYS 432 (3) Physics of Fluids

NOTE:
MATH 315 (3) Ordinary Differential Equations is a required course for the B.Sc. Honours Earth System Science
### 8.0 Consultation with Related Units
- [ ] Yes  
- [ ] No

Attach list of consultations

### 9. Approvals

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<td><strong>ANDREW HYNES</strong></td>
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Submitted by

- Name
- Phone
- Email
- Submission Date

To be completed by ARR:

- CIP Code