



<p>1.0 Degree Title Please specify the two degrees for concurrent degree programs</p> <input type="text" value="Bachelor of Science"/>	<p>2.0 Administering Faculty/Unit</p> <input type="text" value="Science"/>
<p>1.1 Major (Legacy= Subject)(30-char. max.)</p> <input type="text" value="Honours Earth System Science"/>	<p>Offering Faculty/Department</p> <input type="text" value="EPSC / ATOC / GEOG"/>
<p>1.2 Concentration (Legacy = Concentration/Option) If applicable to Majors only (30 char. max.)</p> <input type="text"/>	<p>3.0 Effective Term of Implementation (Ex. Sept. 2004 = 200409) Term</p> <input type="text" value="201309"/>
<p>1.3 Minor (with Concentration, if Applicable) (30 char. max.)</p> <input type="text"/>	

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)

<p>5.1 Program Type</p> <input type="checkbox"/> Bachelor's Program <b>X</b> <input type="checkbox"/> Master's <input type="checkbox"/> M.Sc. (Applied) Program <input type="checkbox"/> Dual Degree/Concurrent Program <input type="checkbox"/> Certificate <input type="checkbox"/> Diploma <input type="checkbox"/> Graduate Certificate <input type="checkbox"/> Graduate Diploma <input type="checkbox"/> Ph.D. Program <input type="checkbox"/> Doctorate Program (Other than Ph.D.) <input type="checkbox"/> Private Program <input type="checkbox"/> Off-Campus Program <input type="checkbox"/> Distance Education Program (By Correspondence) <input type="checkbox"/> Other (Please specify) <input type="text"/>	<p>5.2 Category</p> <input type="checkbox"/> Faculty Program (FP) <input type="checkbox"/> Major <input type="checkbox"/> Joint Major <input type="checkbox"/> Major Concentration (CON) <input type="checkbox"/> Minor <input type="checkbox"/> Minor Concentration (CON) <input checked="" type="checkbox"/> Honours (HON) <b>X</b> <input type="checkbox"/> Joint Honours Component (HC) <input type="checkbox"/> Internship/Co-op <input type="checkbox"/> Thesis (T) <input type="checkbox"/> Non-Thesis (N) <input type="checkbox"/> Other Please specify <input type="text"/>	<p>5.3 Level</p> <input type="checkbox"/> Undergraduate <b>X</b> <input type="checkbox"/> Dentistry/Law/Medicine <input type="checkbox"/> Continuing Ed (Non-Credit) <input type="checkbox"/> Collegial <input type="checkbox"/> Masters & Grad Dips & Certs <input type="checkbox"/> Doctorate <input type="checkbox"/> Post-Graduate Medicine/Dentistry <input type="checkbox"/> Graduate Qualifying <input type="checkbox"/> Postdoctoral Fellows
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6.0 Total Credits

7.0 Consultation with Related Units      Yes  No

Financial Consult      Yes  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...

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## 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 Palaeontology 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..

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## 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 I](#)  
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

Financial Consult

Yes  No

Attach list of consultations

9. Approvals

Routing Sequence

Name

Signature

Date

Department

ANDREW HYNES

Andrew Hynes

2012 NOV 27

Curric/Acad Committee

Faculty 1

Faculty 2

Faculty 3

SCTP

GS

APPC

Senate

Submitted by

Name

To be completed by ARR:

Phone

CIP Code

Email

Submission Date

