

Colorado School of Mines – GRADUATE COUNCIL MEETING MINUTES  
 January 20, 4:00 – 5:00 pm, via Zoom

**Attendees:**

**Voting Members:** 23 total (12 - majority needed for quorum). Quorum was present

P	Neal Sullivan (Chair)	P	Amy Hitchner (LB)	P	Andy Osborne (NSE)	P	Owen Hildreth (ME)
P	Dave Benson (HSE)	P	Karin Leiderman (AMS)	P	Gabe Walton (UCT)	P	Ebru Bozdog (GP)
P	Juan Lucena (EDS)	P	Jim Ranville (GC)	A	Zhenzhen Yu (MME)	P	Geoff Brennecka (ML & MT)
P	Tulay Flamand (EB)	A	Danica Roth (GE)	P	Dejun Yang (CS)	P	Elizabeth Davis (HASS)
P	David Marr (CBE)	P	Maxwell Silver (GSG)	P	Luis Zerpa (PE)	P	*Reza Hedayat (CEE) proxy for Gabe Walton (UCT)
P	Christine Morrison (CH)	P	Gongguo Tang (EE)	P	Jeremy Zimmerman (PH)		

**Other Regular Attendees and Guests**

A	Justin Bush (CEE)	P	Carolyn Freedman (OGS)	A	Jane Ko (AA)	A	Jennifer Velloff (Tref)
P	Tim Barbari (OGS)	A	Cassie Glenn (CEE)	A	Paul Myskiw (RO)	A	Denise Winn-Bower (PE)
P	Dorothy Cheng (CS,EE,ME)	A	Jennie Kenney (AA)	P	*Rachel Bishop (RO) proxy for Paul Myskiw	P	Mara Green (AA)

\*Craig Brice with Mechanical Engineering

**Welcome**

Neal Sullivan

Sullivan welcomes Councilors to the 1/20 Graduate Council meeting. Due to the influx of curriculum items; discussions from the Registrar, Office of Graduate Studies, and Graduate Student Government have been tabled for the following meeting (2/3).

**Curriculum Items- Request for Council Vote** (from 1/6/21)

1.1 **CHEMISTRY**

James Ranville

[status: CIM 12/2; Provost approved: 12/3]

1 new program: CRTG-GE: Certificate and Professional Master's in Analytical Geochemistry

*The addition to the existing Geochemistry Program of a Professional Master's and a Certificate in Analytical Geochemistry supports the Subsurface Frontiers Initiatives by training professionals with skills needed in groundwater resources, mineral exploration and recovery, environmental protection, and basic earth science research. Global challenges to address climate change, more efficient energy production, and discovery and utilization of critical materials all can be more fully addressed by a workforce trained in state-of-the-art methods of analysis.*

A question is asked regarding the prefix GEGX, which represents Geological Exploration within the Geology department. Additionally, the certificate text initially calls for CHGCXXX which is named Analytical Geochemistry. This was been edited administratively during the meeting.

New language has been added to the Professional Master's degree in Analytical Geochemistry. Ranville explains that a Professional Master's in Environmental Geochemistry is being offered and the idea was to take this certificate with 12 credits and either combine it with the certificate in Geochemical Aspiration in the Geology program or use provided existing courses and create a second PM degree.

Sullivan brings up 18 defined credit hours and 12 undefined credits; Sullivan adds that this was done to allow for six credits of independent study and additional electives. Council decides to approve the

pending corrections of the Professional Master's and Certificate language so that the program can move into the next voting process in Senate.

**MOTION:** To approve the new program pending modifications to the credit's language in the Professional Master's program in Chemistry: Certificate and Professional Master's in Analytical Geochemistry as championed by James Ranville by Hildreth, seconded by Brennecka. 1 abstention; Silver. APPROVED.

[status: CIM 12/2; Provost approved: 12/3]

1 new course: CHGC508: Analytical Geochemistry

*This course supports the Certificate and Professional Master degree in Analytical Geochemistry and will contribute to "professionally oriented postgraduate education". These new programs will attract working professionals who are interested in building their curriculum with graduate education to achieve excellence in their jobs and be able to meet the challenges of a changing earth resources industry. Specifically, this course provides a unique program, centered on hands on training, that is not offered at any other US institution.*

*Because much of the class involves hands on learning, the class will be taught in hybrid mode (in-class and remote lectures, in class laboratories, and field trips.*

Ranville states that this course has not been offered previously and was given a course number to market the Analytical Geochemistry program. The course displays six hours of lab per week, which is majority project-oriented. Students perform their work in and outside of the laboratory. This course will be assisted by Zhaoshan Chang and Katharina Pfaff.

Ranville expects between five and ten students participating, realistically. The work of the course involves instrumentation so students will be rotated through hands-on and instrumentation as well as work outside of the laboratory on projects.

**MOTION:** To approve the new course CHGC: Analytical Geochemistry as championed by James Ranville by Hildreth, seconded by Brennecka. 1 abstention; Silver. APPROVED.

### **Continuing Curriculum Items – Continued Discussion (for vote 2/3/21)**

#### **2.1 HYDROLOGIC SCIENCE and ENGINEERING**

David Benson

[status: CIM 12/9]

1 program change: MSPHD-HY: MS & PhD – Hydrologic Sci & Eng

*This update expands the number of courses that students can take under the Hydrology, Policy, and Management (HPM) track. The course list is being expanded for two reasons: (1) in response to combined-degree students who want to complete their HSE degree and the HPM track in two semesters and need more course options; (2) to keep pace with the growing number of social science-based courses being developed on campus that are relevant to water professionals.*

#### **2.2 ECONOMICS and BUSINESS**

Tulay Flamand

[status: CIM 12/4]

1 course change: EBG578: Business Operations and Venture Planning

*Name and description change to better reflect course content. Name changed from "Operations and Information Systems", course offered changed from Fall to Spring, effective date changed to Fall 2021.*

Flamand addresses a question from the 1/6 meeting and confirms that the number for this course is not changing, only the content has been modernized to reflect the growing industry.

### 2.3 **APPLIED MATHEMATICS and STATISTICS**

Karin Leiderman

[status: CIM 12/11; Provost approved: 12/11]

1 new course: MATH570: Mathematical Modeling of Spatial Processes in Biology  
*AMS has run this course twice as a special topics course (MATH 498/598) and would like to offer it more regularly.*

The undergraduate substituent MATH470 is in the process of moving through the Undergraduate Council.

### 2.4 **OPERATIONS RESEARCH with ENGINEERING**

Alexandra Newman

[status: CIM 12/13; Provost approved: 12/14]

1 new course: ORWE581: Optimization Models in Manufacturing  
*Helps with the OR MS-NT program and provides an elective within the Advanced Manufacturing Certificate and MS Program. the course delivery is on-line.*

## **New Curriculum Items**

### 3.1 **MECHANICAL ENGINEERING**

Carolyn Freedman

[status: CIM 1/7 & 1/17]

4 program changes: CERTMSPHD-SPACE: CERT, MS, & PhD – Space Resources  
*Program updates include the addition of clarification about the PhD program including process and expectations for the Qualifying Exams, Dissertation Research Proposals and Defense and Required number of Publications and Presentations. Addition of new courses to the SPRS Elective list. Text updates throughout for clarification.*

Sullivan directs Councilors to the language within the PhD program and the expectations of the student that are interested in the entering the program with an existing master's degree. The language creates minor confusion that make discourage students going from the Space Resources MS to the PhD program due to coursework not being counted.

Freedman states that this will be resolved and discussed with Abbud Madrid.

CERTMS-ADVMAN: CERT & MS – Advanced Manufacturing  
*Changes to language in Graduate Certificate in Additive Manufacturing, changes to core requirements of Additive Manufacturing, changes to language in Masters of Science in Advanced Manufacturing (non-thesis), added selection on electives, language changes to Mines' Combined Undergraduate/Graduate Degree program and electives.*

Brice explains that this program was grounded three years ago but now has an approved list of electives that has not been taught in several years. The electives have been removed in this change, new courses have been added, and an increased number of Advanced Manufacturing classes have been added to provide flexibility to the student.

Brice states that the original certificate was titled Advanced Manufacturing but was not overly descriptive. Since there are now two certificates in the program, one has been renamed to Additive Manufacturing while the other is Smart Manufacturing.

A question is asked regarding who is vetting the Advanced Manufacturing, to which Brice states that due to it being an interdisciplinary program it is primarily Brice. However, relevant faculty from various departments such as Electrical and Mechanical Engineering have been referred to and met with.

XCR-ADVMO: Graduate Certificate – Smart Manufacturing

*Language change. Course change: EBG576 (removed), addition of ELECT → allow students to select from courses in Advanced Manufacturing Electives*

Changes summarized are removal of dead electives and edits to core requirements to provide a more up-to-date list.

Owen Hildreth

MSPHD-MECH: MS & PhD – Mechanical Engineering

*Major edits to the structure of the Mechanical Engineering PhD qualifying exam to streamline the exam, improve consistency across the department, expand qualifying exam options to better reflect the academic needs of the department's PhD students.*

Hildreth states that the changes have been made to clean up the language regarding the combined Undergraduate and Graduate program and being clearer about what can go into the non-thesis program and what courses can be double-counted. Language has also been adopted to clarify what qualifies students to get into the ME program.

The largest change that was requested had been to the PhD Qualifier process. The ME department had discussed if the existing process could be considered burdensome. This process has been reduced to an oral exam with a more structured approach between student to student.

The final change noted by Hildreth has been made with the Solid Mechanics Materials and Manufacturing courses. There had been a number of courses that were no longer being taught that had to be removed from the Research Division course list.

A question is raised on where the student qualification information is to be placed, to which Dean Barbari states that this information can be placed in the Admissions page under Mechanical Engineering's specified department.

This information can be moved to the Admissions page in order to avoid inconsistencies between the Mechanical Engineering's Catalog and the Admissions' page information to incoming and prospective students.

Hildreth will bring these discussion points to the department for further inspection and editing.

2 course changes: MEGN510: Theory of Elasticity

*Course name changed. "Solid Mechanics of Materials" to "Theory of Elasticity", additional information added to course description; nature of course not changed.*

The purpose of the change was to provide a natural sequence for graduate students requesting a graduate-level course for elasticity. There had been a 400-level course but this was split in order to provide deeper information in the MEGN510 course.

The 400-level course is running through Undergraduate Council.

6 new courses:           AMFG523: Design and Analysis of Experiments  
*This online course provides innovative, state-of-the-art experiment methods to best characterize and optimize systems/processes in most any domain, though particularly so for Mines@150 S&T frontiers (Materials and Advanced Manufacturing, Earth and Space Exploration/Technology/Engineering, Energy and Water).*

***This course has previously been offered as an AMFG Special Topics Course and will be cross-listed with AMFG423.***

                                  AMFG581: Optimization Models in Manufacturing  
*Helps with the OR MS-NT program and provides an elective within the Advanced Manufacturing Certificate and MS program. The course delivery is online.*

***This course will be cross-listed with ORWE581 and was offered previously as a special topics course.***

                                  AMFG592: Additive Manufacturing Build Preparation  
*This course serves to give students industrially relevant practical knowledge and experience related to additive manufacturing. The content of this course will also be attractive to working professionals which will serve to expand continuing education available at Mines. The course will be offered online, asynchronous and primarily project based.*

***This has been run previously as a Special Topics Course in AMFG.***

                                  SPRS505: Space Operations  
*This online course will prepare students in this program to designs space mission architectures that support space resources to enable further exploration and commercial activities in space. This course will be delivered online.*

***This course was previously offered as an SPRS Special Topics Course.***

                                  SPRS506: International Space Law & Policy  
*This online course will prepare students in this program to evaluate the legal and policy reasoning, as well as ethical considerations underlying the past, present, and future uses of space for civil, military and commercial development, particularly space resource utilization. This course will be delivered online.*

***This course was previously offered as an SPRS Special Topics Course.***

[status: CIM 1/7; Provost: 1/8] Owen Hildreth

                                  MEGN651: Advanced Computational Fluid Dynamics  
*This course covers fundamentals of computational fluid dynamics for stimulating unsteady incompressible fluid flows, including heat and mass transport. The course is modeled on similar coursed offered at most top research institutions, but lacked at Mines. Course will expand offerings at Mines and will grow the scale and impact of ME research.*

Hildreth states that this course has been taught three times over as a 598 course and is now receiving a course number.

3.2     **MATERIALS SCIENCES**  
[status: CIM 1/15]

Geoff Brennecka

1 course change: MLGN517: Theory of Elasticity  
*Cross-listed with MEGN510; changes made to maintain consistency. No other changes.*

This was a legacy from a previous cross-list, the information within the Catalog was updated to reflect the current cross-listing.

### 3.3 ECONOMICS and BUSINESS

Tulay Flamand

[status: CIM 1/18]

1 program change: MS-ETM-NT: Engineering and Technology Management (ETM) Master of Science

*Deletion of electives: EBGN 515, 567, 573, 5XX from "Technology Management and Innovation" list. These courses have not been offered in about 5 years. Added EBGN 578 to this list.*

Flamand states that the electives listed have not been offered in several years and were removed to remain updated in the Catalog.

1 new course: EBG544: Innovate X

*Innov8x fills an entrepreneurship and innovation gap in our curricula in the area of problem definition: the investigation and framing of a wicked problem in the context of ambiguity, uncertainty, and complexity and hands-on, and the iterative process of solving problems creatively. The course provides professionally oriented pre- and post-graduate education options and is already attracting new students to Mines.*

This course works on applying engineering skills to the real world. A question is asked regarding the trademark of the name, and whether it has been trademarked. The name for the course itself is InnovateX but has been written in the syllabus as Innov8x.

### 3.4 ELECTRICAL ENGINEERING

Dorothy Cheng

[status: CIM 1/13]

1 program change: MSCR-SEPS: Smart-Grid, Power Electronics, and Electrical Power Systems  
Language changes, no substantive changes to the program itself.

Cheng states the only change added to the program being if a student would like a course substitution that is not available on the schedule, the department should be contacted. No other changes have been made to the program.

### 3.5 APPLIED MATHEMATICS and STATISTICS

Karin Leiderman

[status: CIM 1/14]

1 program change: MSPHD-AMS: MS & PhD – Applied Math/Statistics

*Change to required coursework and language within the program. Courses changed: **Specialty in Computational & Applied Mathematics**; MATH501 (removed), **Specialty In Statistics**; MATH530 (removed), MATH560 (added), **Specialty in Computational & Applied Mathematics**; MATH501 (removed), MATH588 (added), **Specialty in Statistics**; MATH530 (removed), MATH 560 and 588 (added).*

Leiderman provides an overview of the changes made to the program: a course sequence had been used for graduate students in Statistical Methods and a few courses have been changed to reflect graduate-service courses that are now being used in the Data Science program and in additional departments.

The name has since then been changed Introduction to Statistical methods and has been removed from

the core required courses within the program. In its place is Introduction to Statistical Learning as a core course for PhD students.

1 course change: MATH531: Theory of Linear Models  
*Course name changed from "Statistical Methods II" to Theory of Linear Models.*

*Over time, the content of MATH531 has become less focused on preparing graduate statistics students and more as a 500-level version of MATH424. The material in this course will be taught in a more mathematical perspective. Change in prerequisites, course description changed to reflect changes.*

### 3.6 CIVIL and ENVIRONMENTAL ENGINEERING

Reza Hedayat

[status: CIM 1/12 & 1/13]

2 program changes: MSPHD-CEE: MS & PhD – Civil Eng & Environmental Eng  
*Language clarification, addition and removal to core courses in **Structural Engineering**: CEEN543 (removed), CEEN545 (added), CEEN533 (added).*

Hedayat states that the program changes are mainly clarification of language; this was discussed during the CEE department retreat where additional points had been clarified for students. There have been changes to the list of core courses and within the Structural Engineering track where the courses listed had not been offered in some time.

These courses have been replaced with two separate courses that are more routinely offered in the CEE department.

XCR-ENVMOD: Graduate Certificate in Environmental Modeling  
*Number of course credits changed from 12 to 9. The elective course is eliminated to reduce the required number of courses needed for the certificate program to make it more appealing, accessible, and affordable with better student retention for the timely completion of the certificate program in one year.*

The minimum requirement has been changed from 12 credits to 9; however, all three core courses have remained the same within the original certificate.

1 course change: CEEN595: Analysis of Environmental Impact  
*Course description change; more than 30% of description changed in order to reflect nature of the course; no other changes made.*

Details have been added to the course description in order to provide clarification of the course content.

### 3.7 QUANTITATIVE BIOSCIENCES and ENGINEERING

Karin Leiderman

[status: CIM 1/16; Provost: 1/17]

3 new courses: BIOL500: Cell Biology and Biochemistry  
*This course will provide students with deep biological insight as well as hands-on experience of studying a biological question at the level of the cell. Meanwhile discussions on launching a new interdisciplinary undergraduate biological engineering program are ongoing on campus. As a core course for these two programs, this Cell Biology and Biochemistry course is necessary to be offered as a regular course in every academic year.*

***This course has been previously offered as a BIOL and CHGN special topics courses.***

BIOL510: Bioinformatics

*This course will be mainly delivered by lectures. Because of the interdisciplinary nature of the course, the backgrounds of the students to take course will be very diverse. Therefore, face-to-face interactions are of significant importance to timely address various students' needs so as to successfully deliver knowledge to the students.*

Leiderman states that all of this course has been offered through Computer Science and is now being provided a biology prefix and course number.

These various courses are being added to the XXX courses provided in the QBE program.

BIOL520: Systems Biology

*This course provides students as introduction to the emerging field of systems biology. It will consist of lectures, group discussion sessions, and problem-solving sessions and/or computational labs. Meanwhile discussions on launching a new interdisciplinary undergraduate biological engineering program are ongoing on campus. As a core course for these two programs, this Systems Biology course is necessary to be offered as a regular course in every academic year.*

***This course has previously been offered as a MATH special topics course.***

**Adjourn**

Meeting adjourned at 5:15pm.

Next Meeting: February 2, 4:00 – 5:00 pm, via Zoom.

Neal Sullivan

**Consent Agenda**

The following proposals will not be discussed unless specifically requested by Council. With no objections, approval is implied and items will be processed accordingly.

- **Approval of Minutes** – January 6, 2021

Neal Sullivan

**4.1 MECHANICAL ENGINEERING**

[status: CIM 1/17]

5 course changes: AMFG501: Additive Manufacturing  
AMFG522: Lean Manufacturing

*Catalog description revised for clarity.*

SPRS501: Space Resources Fundamentals  
SPRS502: Space Systems Engineering  
SPRS503: Space Resources Seminar  
SPRS591: Space Resources Project I  
SPRS592: Space Resources Project II

*Minor changes to Catalog description language, changes to SPRS prerequisites.*

Carolyn Freedman

**4.2 CIVIL and ENVIRONMENTAL ENGINEERING**

[status: 1/11]

7 course changes: CEEN512: Soil Behavior  
*Prerequisite listed with incorrect course number.*

CEEN523: Underground Construction Engineering in Soft Ground

*Corequisite was listed incorrectly and revised.*

CEEN531: Structural Dynamics

*Typos corrected in course description.*

Reza Hedayat



CEEN560: Molecular Microbial Ecology and the Environment

*Edits to course description to include laboratory component; correction to description to make course accessible to CEE graduate students.*

CEEN573: Reclamation of Disturbed Lands

*Sentence added to course description to reflect course content; no other changes.*

CEEN587: Hydrochemical and Transport Processes

*Course title change Hydrogeochemical and Transport Processes → Hydrochemical and Transport Processes; no other changes.*

#### 4.3 CHEMISTRY

Reza Hedayat

[status: CIM 1/11]

1 course change: CHGC555: Environmental Organic Chemistry

*Prerequisite removed. Course was removed 10 years ago but not reflected in the Catalog.*

#### 4.4 COMPUTER SCIENCE

Dorothy Cheng

[status: CIM 1/19]

5 course changes: CSCI560: Fundamentals of Computer Networks

CSCI568: Data Mining

CSCI571: Artificial Intelligence

CSCI572: Computer Networks II

CSCI585: Information Security Privacy

*Correction to course semester offered.*

6 course deactivations: CSCI522: Introduction to Usability Research

CSCI546: Web Programming II

CSCI547: Scientific Visualization

CSCI576: Wireless Sensor Systems

CSCI692: Graduate Seminar

CSCI693: Wave Phenomena Seminar

*Courses no longer regularly offered. CSCI692 is duplicate of CSCI691.*

#### 4.5 ELECTRICAL ENGINEERING

Dorothy Cheng

[status: CIM 1/7]

33 course changes:

EENG507: Introduction to Computer Vision

EENG508: Advanced Topics in Perception and Computer Vision

EENG509: Sparse Signal Processing

EENG511: Convex Optimization and its Engineering Applications

EENG515: Mathematical Methods for Signals and Systems

EENG517: Theory and Design of Advanced Control Systems

EENG519: Estimation Theory and Kalman Filtering

EENG521: Numerical Optimization

EENG525: Antennas

EENG526: Advanced Electromagnetics

EENG527: Wireless Communications

EENG528: Computational Electromagnetics

EENG529: Active Rf & Microwave Devices

EENG530: Passive Rf & Microwave Devices

EENG531: Active Nonlinear Rf & Microwave Devices

EENG532: Low Temperature Microwave Measurements for Quantum

EENG536: Phased & Adaptive Rays

EENG540: Introduction to Radar Systems  
 EENG570: Advanced High Power Electronics  
 EENG571: Modern Adjustable Speed Electric Drives  
 EENG572: Renewable Energy and Distributed Generation  
 EENG573: Electric Power Quality  
 EENG577: Advanced Electrical Machine Dynamics for Smart-Grid  
 EENG580: Power Distribution Systems Engineering  
 EENG581: Power System Operation and Management  
 EENG582: High Voltage AC and DC Power Transmission  
 EENG583: Advanced Electrical Machine Dynamics  
 EENG584: Power System Risk Management  
 EENG586: Communication Networks for Power Systems  
 EENG587: Power Systems Protection and Relaying  
 EENG588: Energy Policy, Restructuring and Deregulation of Electricity  
 EENG589: Design and Control of Wind Energy Systems  
 EENG618: Nonlinear and Adaptive Control

*Change to course semester offered.*

4.6 **GEOLOGY and GEOLOGICAL ENGINEERING** Reza Hedayat

[status: CIM 1/12]

1 course change: GEGN587: Hydrochemical and Transport Processes

*Course name change from "Hydrogeochemical" to "Hydrochemical".*

4.7 **APPLIED MATHEMATICS and STATISTICS** Karin Leiderman

[status: CIM 1/14]

1 course change: MATH532: Spatial Statistics

*Change to MATH531, 532 no longer requires it as a prerequisite.*

4.8 **ECONOMICS and BUSINESS** Tulay Flamand

[status: CIM 1/20]

8 course changes: EBGN528: Industrial Systems Simulation  
 EBGN555: Linear Programming  
 EBGN559: Supply Chain Management  
 EBGN563: Management of Technology  
 EBGN565: Marketing for Technology-Based Companies  
 EBGN566: Technology Entrepreneurship  
 EBGN572: International Business Strategy  
 EBGN585: Engineering and Technology Management Capstone

*Removal of prerequisites.*