REQUEST TO COLLEGE CURRICULUM COMMITTEE FOR CURRICULAR IMPROVEMENTS

DEPARTMENT: Geological and Environmental Sciences
PROPOSED EFFECTIVE SEMESTER: Fall 2019 RCD 5/2/18
COLLEGE: College of Arts and Sciences

PROPOSED IMPROVEMENTS

** Academic Program
- New degree*
- New major*
- New curriculum*
- New concentration*
- New certificate
- New minor
- Revised major
- Revised minor
- Admission requirements
- Graduation requirements
- Deletion
- Transfer
- Other (explain)**

** Substantive Course Changes
- New course
- Pre or Co-requisites
- Deletion (required by others)
- Course #, different level
- Credit hours
- Enrollment restriction
- Course-level restriction
- Prefix □ Title and description

** Misc. Course Changes
- Title
- Description (attach current & proposed)
- Deletion (not required by others)
- Course #, same level
- Variable credit
- Credit/no credit
- Cross-listing
- COGE reapproval
- Other (explain**)

** Title of degree, curriculum, major, minor, concentration, or certificate: Doctor of Philosophy in Geosciences

Existing course prefix and #: Proposed course prefix and #: Credit hours:

Existing course title:

Proposed course title:

Existing course prerequisite & co-requisite(s):

- If there are multiple prerequisites, connect with "and" or "or". To remove prerequisites, enter "none."

Proposed course prerequisite(s):

- If there are multiple corequisites, they are always joined by "and."

Proposed course prerequisite(s) that can also be taken concurrently:

- Is there a minimum grade for the prerequisites or corequisites?
  - The default grades are D for undergraduates and C for graduates.

Major/minor or classification restrictions:

- List the Banner 4 character codes and whether they should be included or excluded.

Specifications for University Schedule of Classes:

- For 5000 level prerequisites & corequisites: Do these apply to: (circle one) undergraduates graduates both

  a. Course title (maximum of 30 spaces):
  - Multi-topic course: □ No □ Yes
  - Repeatable for credit: □ No □ Yes
  - Mandatory credit/no credit: □ No □ Yes

  e. Type of class and contact hours per week (check type and indicate hours as appropriate)

    1. □ Lecture
    2. □ Lab or discussion
    3. □ Lecture/lab/discussion
    4. □ Seminar or □ Studio
    5. □ Independent study
    6. □ Supervision or practicum

CIP Code (Registrar’s use only):

Chair/Director ______________________ Date 5/2/18

Chair, College Curriculum Committee ______________________ Date

Dean ______________________ Date Graduate Dean: ______________________ Date

Curriculum Manager: Return to dean □ Date Forward to: ______________________ Date

Chair, COGE/ PEB / FS President ______________________ Date

FOR PROPOSALS REQUIRING GSC/USC REVIEW:

- □ Approve □ Disapprove Chair, GSC/USC ______________________ Date

- □ Approve □ Disapprove Provost ______________________ Date

Revised May 2007. All previous forms are obsolete and should not be used. CAS17-301GEOS REVISED
1. Explain briefly and clearly the proposed improvement.

The current program requires students take 3 core courses from a set of 4 core courses. The current core courses are:

1. GEOS 5120 – Principles of Hydrogeology
2. GEOS 5550 – Introduction to Geochemistry
3. GEOS 6600 – Introduction to Geophysics
4. Sedimentology and Stratigraphy – choose one of the following: GEOS 6110 – Advanced Stratigraphy, GEOS 6450 – Clastic Petrology and Petrophysics, GEOS 6460 – Carbonate and Evaporite Depositional Systems, GEOS 6550 – Quantitative Basin Analysis, GEOS 6560 – Clastic Depositional Systems, and GEOS 6650 – Carbonate Petrology

The current proposal is to continue requiring the students to take 3 core courses from the four themes, but to decrease the number of choices in the Sedimentology and Stratigraphy theme. The core courses that will be allowed for the Sedimentology and Stratigraphy theme will be limited to: GEOS 5110 – Advanced Stratigraphy, GEOS 6460 – Carbonate and Evaporite Depositional Systems, and GEOS 6560 – Clastic Depositional Systems. In a separate request, GEOS 6110 will be dropped to the 5000 level (GEOS 5110) – this will provide an introductory course at the same level as in the other themes. The two petrology courses (6450 and 6650) and Basin Analysis (6550) are more advanced courses that are essential to students who choose to specialize in sedimentary geology, but are not necessary for students specializing in other areas of the Geosciences.

2. Rationale. Give your reason(s) for the proposed improvement. (If your proposal includes prerequisites, justify those, too.)

By limiting the courses in the Sedimentology and Stratigraphy theme, the department is recognizing that some of the courses are designed for a wide audience in the department's graduate student population (i.e. GEOS 5110, GEOS 6460, GEOS 6550), while our other 6000 level courses are designed for students who want to come out of their degree program with an emphasis on Sedimentology and Stratigraphy.

3. Effect on other colleges, departments or programs. If consultation with others is required, attach evidence of consultation and support. If objections have been raised, document the resolution. Demonstrate that the program you propose is not a duplication of an existing one.

No effect on other colleges, departments or programs.

4. Effect on your department's programs. Show how the proposed change fits with other departmental offerings.

We will still offer all of the courses in the Sedimentology and Stratigraphy theme – most are currently offered every other year. We may see an increase in enrollment in GEOS 5110 – as this course would be open to both undergraduate and graduate students. Currently at least two courses are offered each year (1 fall, 1 spring) and three courses in alternate years (2 fall, 1 spring).

With the change to just allowing 5110, 6460 and 6560 for credit in the Sedimentology and Stratigraphy track, students will still be able to fulfill the requirement readily – as at least one of these courses will be offered each year.

5. Effects on enrolled students: Are program conflicts avoided? Will your proposal make it easier or harder for students to meet graduation requirements? Can students complete the program in a reasonable time? Show that you have considered scheduling needs and demands on students' time. If a required course will be offered during summer only, provide a rationale.

This proposal should increase the success rate of students taking coursework in the sedimentology and stratigraphy theme. All three courses (GEOS 5110, GEOS 6460 and GEOS 6560) are offered every other year, so there would still be opportunity for students to fulfill this core requirement every academic year.

6. Student or external market demand. What is your anticipated student audience? What evidence of student or market demand or need exists? What is the estimated enrollment? What other factors make your proposal beneficial to students?

The courses removed from the core course list (6450, 6550, and 6650) will likely see small drops in enrollment. The courses retained (GEOS 5110, GEOS 6460, and GEOS 6560) will likely see small increases in enrollment. With advanced stratigraphy taught at the 5000 level, we may also see an increase due to new enrollment by undergraduate students taking this course as an elective course.
7. Effects on resources. Explain how your proposal would affect department and University resources, including faculty, equipment, space, technology, and library holdings. If proposing a new program, include a letter and/or email of support from the university library affirming that the library resource issues have been reviewed. Tell how you will staff additions to the program. If more advising will be needed, how will you provide for it? How often will course(s) be offered? What will be the initial one-time costs and the ongoing base-funding costs for the proposed program? (Attach additional pages, as necessary.)

No effect on resources, as the courses would be continued to be taught. The courses removed from the core course list (6450, 6550, and 6650) will likely see small drops in enrollment. The courses retained (GEOS 5110, GEOS 6460, and GEOS 6560) will likely see small increases in enrollment.

No change in advising – the students are provided an overview of core courses in their graduate student handbook and during the department's graduate student orientation. The change in core courses will not impact the semester reviews carried out by the graduate advisor.

No one-time costs or base-funding costs are expected with this change.

8. General education criteria. For a general education course, indicate how this course will meet the criteria for the area or proficiency. (See the General Education Policy for descriptions of each area and proficiency and the criteria. Attach additional pages as necessary. Attach a syllabus if (a) proposing a new course, (b) requesting certification for baccalaureate-level writing, or (c) requesting reapproval of an existing course.)

NA

9. List the learning outcomes for the proposed course or the revised or proposed major, minor, or concentration. These are the outcomes that the department will use for future assessments of the course or program.

Students will develop:

1. An understanding of basic stratigraphic techniques – understand the terminology, techniques and theory supporting major stratigraphic methods such as sequence stratigraphy, chemostratigraphy, biostratigraphy, etc.

2. An understanding of the architecture of different depositional environments, including understanding the impacts of currents (water, wind), physical processes of sedimentation (distribution and composition of sediments in environment), biological processes (reef construction, burrowing, etc.), and chemical processes (early diagenesis, water chemistry) in both clastic and carbonate depositional environments.

3. An understanding of how depositional environments respond to changes in climate, sea level or tectonic environment in both clastic and carbonate depositional environments.

10. Describe how this curriculum change is a response to assessment outcomes that are part of a departmental or college assessment plan or informal assessment activities.

Informal discussions with students and with faculty led to this suggested curriculum change. The faculty teaching the graduate courses in the sedimentology and stratigraphy track recognized that having a lower level introductory course (proposed GEOS 5110) would be benefit students, as the students would be able to take 5110 as an introductory course before trying some of the more intense 6000 level courses.

11. (Undergraduate proposals only) Describe, in detail, how this curriculum change affects transfer articulation for Michigan community colleges. For course changes, include detail on necessary changes to transfer articulation from Michigan community college courses. For new majors or minors, describe transfer guidelines to be developed with Michigan community colleges. For revisions to majors or minors, describe necessary revisions to Michigan community college guidelines. Department chairs should seek assistance from college advising directors or from the admissions office in completing this section.

NA

12. Please offer both “Current Catalog Language” and “Proposed Catalog Language” if there is to be a change in the catalog description for a given course and/or program. For the “current” language, please copy and paste relevant language from the most current catalog and for the “proposed” language, please share the exact proposed new catalog language. As possible, bold or otherwise note the key changes in the new proposed catalog language.

Current Catalog Language
Doctor of Philosophy in Geosciences

The Doctor of Philosophy in Geosciences is a research degree designed for persons intending to take leadership roles in teaching and research in one of four core areas of the Geosciences: Hydrogeology; Geochemistry and Economic Geology; Geophysics and Tectonics; Stratigraphy and Sedimentary Geology. Applicants will be expected to meet the minimum entrance requirements of the Graduate College and must demonstrate an interest in, and aptitude for, conducting high quality research.

Please note: Under exceptional circumstances, a student may request that the primary advisor petition the faculty for approval of modifications to the timelines stated below. Exceptions may only be granted by faculty vote.

Admission Requirements

1. Bachelor's or master's degree in geology or related field is required; an M.S. degree is strongly recommended. Students must have completed, or must complete as soon as possible upon enrollment, GEOS 1300, 1310, 3010 or 3350, and a field experience such as 5390 or its equivalent. Any remedial course work completed upon enrollment in the graduate program must be completed with grade of "B" or better to satisfy this requirement. For students who enter the program with course work deficiencies, program requirement timelines (see below) will begin once remedial work has been satisfactorily completed, rather than upon matriculation in the program.

2. Grade-point average of 3.25 (of 4.0) for prior graduate work. To be admitted without an M.S. degree, a GPA of at least 3.25 (of 4.0) during the previous two years of undergraduate work is required.

3. Three letters of recommendation are required of all applicants from persons well situated to evaluate his/her qualifications for graduate study. If they are coming from a faculty member at a college or university, the letter should be on that school's letterhead. Letters must be submitted through the WMU electronic application system.

4. Applicants must submit the results of the Verbal Reasoning, Analytical Writing, and Quantitative Reasoning portions of the Graduate Record Examination (GRE).

Financial Assistance

Several departmental, University and grant-funded fellowships, teaching assistantships, and research assistantships are available. Application forms and additional information are available from the Department of Geological and Environmental Sciences and from the Graduate College.

Program Requirements

1. Choose a graduate advisor within two semesters following matriculation. Within three semesters following matriculation, the student must choose a doctoral committee. This committee will be chaired by the student's primary advisor, and must include one other faculty member from within the Geological and Environmental Sciences Department, as well as a third committee member from outside the Geological and Environmental Sciences Department. It is strongly recommended that the third committee member be chosen from an outside research facility or university, although members may also be chosen from other programs at WMU, if appropriate. The committee should be chosen to reflect the doctoral student's expressed research interests. The committee will facilitate and guide the student's development within the academic and research programs of the department and University.

2. Complete at least three research credit hours directed toward preparing a dissertation research proposal, with the student's primary graduate advisor by the end of the second semester of residence.

GEOS 6340 - Research in Geology and Earth Science Credits: 1 to 4 hours

3. Qualifying Requirement.

This requirement must be completed no later than the end of the fourth semester in residence. Students must achieve an average grade of "BA" in three of four core graduate courses. One graduate course in each of the four areas (Hydrology, Geochemistry and Economic Geology, Geophysics and Tectonics, Stratigraphy and Sedimentary Geology) will be designated as a "core" course (see graduate advisor for details). In some cases, students may enter the program with a strong background in one or more of the core areas. Such students may be excused from enrolling in one or more core courses by achieving a grade of "B" or better on the final examination for the course(s). Students who do not achieve a "B" or better in a core area on their first attempt (or an overall average of "BA" for the three courses) will be given one additional opportunity to either pass each core course or the final examination with a grade sufficient to achieve an average of "BA" for the three courses.

4. Proposal Examination:

By the end of the fourth semester, students must develop a written proposal describing their planned doctoral research. This proposal will be presented in a public 20-minute talk. The talk will be followed by a closed-door oral examination, to be conducted by the student's doctoral committee. Students who do not pass the proposal exam will be given one additional opportunity to repeat the examination. A second attempt must be made within a timeframe to be determined by the student's doctoral committee, and must
occur within one year of the first attempt. If the external committee member cannot be present on campus for the proposal examination, they may attend virtually or submit written comments or questions.

5. Complete at least sixty (60) total credit hours of which thirty (30) credit hours must be at the 6000-level or above. At least eighteen (18) GEOS graduate credit hours of course work is required, not including credit from courses used to fulfill the core course requirement, exclusive of GEOS 6340: Research in Geology and Earth Science, GEOS 7100: Independent Research, GEOS 7120: Professional Field Experience, GEOS 7300: Doctoral Dissertation, and GEOS 7350: Graduate Research.

6. Enroll in the following course for at least one semester:
   GEOS 5010 - Geologic Communications and Presentations Credits: 1 hour

7. Complete 15 hours of the following:
   GEOS 7300 - Doctoral Dissertation Credits: 1 to 15 hours

8. Demonstrate proficiency in two appropriate research tools.
   At least one of the research tools must be completed outside of the student’s declared core area of study. Students are strongly encouraged to complete at least one tool via course work or other training outside of the Geological and Environmental Sciences Department. For details regarding acceptable research skills, consult with the graduate advisor. Research tools may include:
   - Achieving a working knowledge of statistics by receiving a grade of “B” or better in an approved course or by showing the ability to apply advanced statistical analysis to the doctoral research.
   - Demonstrating competence in computer science or programming by receiving a grade of "B" or better in an approved course or by applying computer programming to the doctoral research.
   - Demonstrating proficiency in areas relevant to the doctoral research, including mathematics, biological sciences, chemistry, geography, remote sensing, physics, or engineering. Proficiency will be demonstrated by achieving a grade of "B" or better in an approved graduate course.
   - Mastering the design, repair or development of instrumentation used as part of an approved Geosciences course or in the doctoral research.
   - Demonstrating development, while enrolled in the doctoral program, of reading competency in a foreign language relevant (as deemed by the student's primary advisor) to the student's dissertation research. This skill will be demonstrated by receiving a grade of "B" or better in a 4010 course in the language, by passing a standardized examination, or by successfully translating one or more technical articles assigned by the student's primary advisor.

   In each year in residence following a successful dissertation proposal defense, the student must give a 12-minute seminar presentation. An external presentation at an approved (by the student’s doctoral committee) conference will fulfill this requirement in any year of study. The dissertation defense oral presentation, if completed during the academic year, will fulfill this requirement in the final year of study.

10. Students must give at least one scientific presentation in an approved (by the student’s doctoral committee) external venue prior to graduation.

11. At least one first-authored paper must be accepted for publication in a peer-reviewed journal prior to graduation.
    Under exceptional circumstances, the doctoral candidate may petition the Geological and Environmental Sciences faculty to allow a first-authored paper submitted to a journal for peer review to be accepted in lieu of an accepted publication. Decisions regarding the petition will be made by majority vote of the faculty.

    The student will give a 50-minute public presentation. This will be followed by a closed-door defense to be conducted by the members of the student's doctoral committee. See this Graduate Catalog for policies and procedures in the event of an unsuccessful defense. The final written dissertation must conform to the requirements explained in the University's Guidelines for the Preparation of Theses, Projects, and Dissertations and may be written according to one of the following two options:
    a. Option 1:
       The student will write a traditional comprehensive dissertation based on the doctoral research. The dissertation should include an introduction, review of the relevant literature, description of methodology used in the dissertation research, presentation of the results (including appendices of data where appropriate), and discussion of the significance of the research.
    b. Option 2:
       The student will present at least two first-authored journal papers, which may include the paper written to fulfill program requirement #11, that have been accepted for publication in appropriate peer-reviewed journals. A separately written introduction including a brief literature review, summary of the relevance/conclusions of the studies and an appendix of data (where appropriate) must also be submitted.
Our graduate Student Handbook, has the details:

1. What are the core courses?
   Principles of Hydrogeology (GEOS 5120)
   Introduction to Geochemistry (GEOS 5550)
   Introduction to Geophysics (GEOS 5600)
   Sed/Strat (choose one from GEOS 6110, 6450, 6460, 6550, 6560, or 6650)

2. Can I substitute another course for a core course?
   No, only the courses listed above count as cores.

3. How many core courses do I need to take and what grade do I need?
   MA students are not required to take any core courses. MS students must complete two (of four) with a “BA” grade average by the end of their second full year in residence. PhD students must complete three (of four) with a “BA” grade average by the end of their second full year in residence.

4. Can I test out of a core course?
   Yes, you may be excused from enrolling in a core course by earning a grade of “B” or better on the final exam (provided that your average grade across two core courses is a “BA” or better). Contact the instructor of the course to set up the exam, and ask the instructor to send the results of the exam to the Graduate Advisor so that your exemption can be noted in your program file. You should be notified of results within two weeks of taking the exam. Please contact the Graduate Advisor if there is a delay in receiving your exam score.

5. What if I took a core course at another university?
   You may test out of the WMU core course by passing the final exam with a grade of “B” or better. Contact the instructor of the course to set up the exam, and ask the instructor to send the results of the exam to the Graduate Advisor so that your exemption can be noted in your program file. You should be notified of results within two weeks of taking the exam. Please contact the Graduate Advisor if there is a delay in receiving your exam score.

Proposed Catalog Language

The Graduate Catalog will stay the same, however our department handbook for Graduate Students will now read:

1. What are the core courses?
   Principles of Hydrogeology (GEOS 5120)
   Introduction to Geochemistry (GEOS 5550)
   Introduction to Geophysics (GEOS 5600)
   Sed/Strat (choose one from GEOS 5110, 6460, or 6560)

2. Can I substitute another course for a core course?
   No, only the courses listed above count as cores.

3. How many core courses do I need to take and what grade do I need?
   MA students are not required to take any core courses. MS students must complete two (of four) with a “BA” grade average by the end of their second full year in residence. PhD students must complete three (of four) with a “BA” grade average by the end of their second full year in residence.

4. Can I test out of a core course?
   Yes, you may be excused from enrolling in a core course by earning a grade of “B” or better on the final exam (provided that your average grade across two core courses is a “BA” or better). Contact the instructor of the course to set up the exam, and ask the instructor to send the results of the exam to the Graduate Advisor so that your exemption can be
noted in your program file. You should be notified of results within two weeks of taking the exam. Please contact the Graduate Advisor if there is a delay in receiving your exam score.

5. What if I took a core course at another university?
You may test out of the WMU core course by passing the final exam with a grade of “B” or better. Contact the instructor of the course to set up the exam, and ask the instructor to send the results of the exam to the Graduate Advisor so that your exemption can be noted in your program file. You should be notified of results within two weeks of taking the exam. Please contact the Graduate Advisor if there is a delay in receiving your exam score.