Please attach/submit additional documents as needed to fully complete each section of the form.

### COURSE INFORMATION

Department: geosciences  
Course Number: GEO304E  
Course Title: Science and Society

Type of Request: *New* One-time Only Renew* Change Remove

Rationale: *If course has not changed since the last review and is taught by the same tenure-track faculty member, you may skip sections III-V.

### JUSTIFICATION FOR COURSE LEVEL

Normally, general education courses will not carry pre-requisites, will carry at least 3 credits, and will be numbered at the 100-200 level. If the course has more than one pre-requisite, carries fewer than three credits, or is upper division (numbered at the 300 level or above), provide rationale for exception(s).

Although this course does not have any prerequisites, it requires relatively advanced reading, writing, and critical thinking skills. Because a very broad range of majors typically take this course, the foundational skills required may not have been introduced until early upper division courses are taken. For example, essay writing may be introduced at the 100-level to English majors, but not until the 300-level to physics majors. Critical thinking and logical discourse may be introduced at the 100-level for philosophers, but only at the 300-level to musicians. Offering the course at the 300-level ensures that most students will have the necessary foundational skills and represents the complexity of the course content relative to the host department (geosciences) curricular structure.

### ADDITIONAL INFORMATION (FOR OCHE DATABASE):

In which MUS Core Category, does this course fit? Social Science/History  
Does the course include content regarding cultural heritage of American Indians? no

### II. ENDORSEMENT / APPROVALS

* Instructor: Rebecca Bendick  
Signature ______________________ Date__________  
Phone / Email: 406-370-8482 bendick@mso.umt.edu

Program Chair: James Staub  
Signature ______________________ Date__________

Dean: Chris Comer  
Signature ______________________ Date__________

*Form must be completed by the instructor who will be teaching the course. If the instructor of the course changes before the next review, the new instructor must be provided with a copy of the form prior to teaching the course.
III. DESCRIPTION AND PURPOSE

General Education courses must be introductory and foundational within the offering department or within the General Education Group. They must emphasize breadth, context, and connectedness; and relate course content to students’ future lives: See Preamble

This course is intended to introduce students to the history and ethics of science in the context of society and culture. Part of the course is designed to provide students with a foundational understanding of how intellectual discoveries and rules for their just application both were shaped by and shaped societies and cultures. Part of the course is designed to guide students through the application of ethical perspectives to scientific issues relevant in our own present society and culture. Learning goals include developing proficiency in the following skills: applying concepts and forms of reasoning to ethical issues in science topics, analyzing and evaluating forms of reasoning, identifying and using traditions of ethical thought, identifying and using traditions in the history of science, and evaluating ethical discourse.

This is a small enrollment course for honors students, which uses guided discussions of modern analysis, especially a history of science (Ede and Cormack, A history of science and society) textbook and an ethics primer (Sandel, Justice) along with readings from primary sources to first introduce ethical traditions, then practice their application on historical examples, then practice their application on urgent modern issues.

IV. CRITERIA

BRIEFLY EXPLAIN HOW THIS COURSE MEETS THE CRITERIA FOR THE GROUP.

1. Courses focus on one or more of the specific traditions of ethical thought (either Western or non-Western), on basic ethical topics such as justice or the good life as seen through the lens of one or more traditions of ethical thought, or on a professional practice within a particular tradition of ethical thought.

Part 1 of this course systematically introduces several traditions of ethical thought in historical order, including classical ethics, Christian ethics, utilitarianism, libertarianism, deontological ethics, and modern ethics. The class discussions include consideration of the social, political, and cultural context, including but not limited to advances in natural philosophy and science (sometimes indistinguishable) at the time. The emphasis is on how this context informs and demands certain ethical approaches, and how, in turn, moral considerations shape other kinds of thought. By the end of part 1, students are expected to demonstrate basic familiarity with the main traditions, including what they entail and how they are applied.

For example, in the week on the Enlightenment, we discuss how the scientific revolution, especially Newtonian physics, introduced a mechanistic and quantitative world view. This, in turn, set the stage for the notion of fundamental laws, not only in physics, but in politics, economics and, especially, in philosophy, such that leading thinkers sought deterministic algorithms that could guide us to what is right and wrong. We explore the relationship of utilitarianism to this context, and then discuss the principles and application of utilitarianism to issues of the time, such as in the foundational documents of the United States.

2. Courses provide a rigorous analysis of the basic concepts and forms of reasoning which define the traditions, the ethical topics, or the professional practices that are being studied.

Part 2 of this course guides students through the application of ethical traditions to modern issues incorporating both scientific and socio-cultural components. They are encouraged to assess modern issues using one or more of the traditions introduced in part 1, especially to consider how one might arrive at different conclusions using different ethical standards. Students are also guided through consideration of how scientific data and new discoveries both help to resolve ethical dilemmas (such as how technological innovations can mitigate physical and mental disabilities, or how modern neuroscience can inform ideas of responsibility and guilt) and create new ones (such as how our ability to prolong life makes end-of-life decisions more complicated). Students also practice methods for hearing and understanding diverse perspectives, and for engaging in reasoned discourse on sensitive and emotional topics. Finally, students are encouraged to adopt personal positions on topics that are important to them, and commit to remaining informed and engaging with these topics in the future.
V. STUDENT LEARNING GOALS

BRIEFLY EXPLAIN HOW THIS COURSE WILL MEET THE APPLICABLE LEARNING GOALS.

1. Correctly apply the basic concepts and forms of reasoning from the tradition or professional practice they studied to ethical issues that arise within those traditions or practices.

As noted above, part 2 of this class is dedicated to the application of ethical traditions. Students gain familiarity and proficiency with these traditions through the historical exploration. We then apply them directly to critical issues of our time. In the representative syllabus provided as supporting material to this application, I list several topics that have been approached in recent course implementations. For example, in 2015, we discussed migration and refugees. To introduce the best available scientific constraints on the issue, the class read a special feature in New Scientist (a magazine reporting scientific discoveries) about quantifying the economic contributions of migrant populations. This material also includes demographic analyses of aging European populations and their likely productivity over the next several decades. In 2015, the second set of discussion materials focused on research on extremism, but in the modified version of the syllabus for future course implementation (including in 2016), the group will read and discuss a recent BBC program with Michael Sandel on the ethics of abolishing borders. The interplay between the research results and the moral considerations will be emphasized.

2. Analyze and critically evaluate the basic concepts and forms of reasoning from the tradition or professional practice they studied

As noted above, part 1 of this class introduces the basic concepts and forms of reasoning for several different ethical traditions, in the historical context. Emphasis is placed on the interactions among social changes, intellectual discoveries (especially scientific) and morality. With each tradition, its philosophic basis and its application are developed through guided discussion.

VI. ASSESSMENT

A. HOW ARE THE LEARNING GOALS FOR THE GENERAL EDUCATION GROUP MEASURED?

Describe how you will determine that students have met each of the General Education Learning Goals. This should include specific examples of assignments, rubrics or test questions that directly measure the General Education learning goals. (See Example)

Please attach or provide a web link to relevant assessment materials.

1. Correctly apply the basic concepts and forms of reasoning from the tradition or professional practice they studied to ethical issues that arise within those traditions or practices.

Please see the attached assessment document using the format of the example provided.

Students are assessed primarily on learning goal 2 in the first half of the class, and on learning goal 1 in the second half of the class. In each case a combination of informal and formal assessment tools are used:

Part 2

Informal assessment: During each class discussion (each class meeting), the instructor assigns a qualitative value to each student corresponding to their participation in the discussion. There are three possible values, +, 0, and -. A score of + corresponds to active participation demonstrating understanding of and engagement with the material. A score of 0 corresponds to limited participation, mainly suggesting limited engagement with the material. A score of – corresponds to no participation. Students are not penalized for misunderstanding the content if they demonstrate an attempt to
understand and effort during the discussion to improve or change their understanding. At the end of part 1, these participation scores are tallied into a composite engagement score.

Formal assessment: The final project for this class requires that the student participate in some activity that represents their position on a modern issue combining science and ethics. Activities may be chosen by the student, but they must include active engagement, such as volunteering with an organization, creating media for open distribution, teaching, or participating in actions calling for justice. The student is graded based on the relationship of their activities to issues of science and ethics, the level of effort required, and their justification for the position taken.

2. Analyze and critically evaluate the basic concepts and forms of reasoning from the tradition or professional practice they studied

Students are assessed primarily on learning goal 2 in the first half of the class, and on learning goal 1 in the second half of the class. In each case a combination of informal and formal assessment tools are used:

Part 1

Informal assessment: During each class discussion (each class meeting), the instructor assigns a qualitative value to each student corresponding to their participation in the discussion. There are three possible values, +, 0, and -. A score of + corresponds to active participation demonstrating understanding of and engagement with the material. A score of 0 corresponds to limited participation, mainly suggesting limited engagement with the material. A score of – corresponds to no participation. Students are not penalized for misunderstanding the content if they demonstrate an attempt to understand and effort during the discussion to improve or change their understanding. At the end of part 1, these participation scores are tallied into a composite engagement score.

Formal assessment: A midterm essay assignment requires the students to explain one or more historical ethical concepts, including its relation to the social and intellectual context of the historical period. The essay requires the student to apply the concept to a relevant historical scientific issue.

Examples from past midterms include the following prompts:

   a. What are scholarly ethics? Are they fundamental to human study, or do they change in different social, economic, and cultural settings? Support your position using both historical and modern examples. (2015)
   b. What do you think is the most important scientific contribution in history? Why? How did this discovery create new social and ethical challenges? (2014)
   c. What is the difference between theoretical and empirical knowledge? What are the critical considerations in developing them? Give examples from historical arguments to support your argument. (2013)

These papers are graded using contract grading, with the rubric provided to students in advance of the assignment. A ‘B’ grade is assigned to all papers that (1) provide a thesis statement with a plausible response to the prompt; (2) maintain internal consistency between a thesis statement and supporting material; (3) demonstrate basic proficiency in reasoning; and (4) demonstrate proficiency with the historical material discussed in class. An ‘A’ grade is assigned to all papers that satisfy the ‘B’ requirements plus add novel material, novel perspectives, supporting material beyond sources discussed in class, or creative and novel reasoning. A ‘C’ grade is assigned to all papers that do not meet the ‘B’ criteria. Grades lower than ‘C’ may be assigned to papers that miss several of the ‘B’ criteria. The paper assignment tests whether students can apply the basic concepts in one or more classical ethical traditions within the historical context.
A General Education Assessment Report will be due on a four-year rotating cycle. You will be notified in advance of the due date. This will serve to fulfill the University’s accreditation requirements to assess general education and will provide an opportunity to connect with your colleagues across campus and share teaching strategies. Items VI.B- D will be helpful in compiling the report.

B. ACHIEVEMENT TARGETS
[This section is optional. Achievement targets can be reported if they have been established.]
Describe the desirable level of performance for your students, and the percentage of students you expected to achieve this:

1. Describe and understand several main Western ethical traditions (classical, virtue, utilitarian, libertarian, Kantian). (100%)

2. Apply one or more ethical standards to modern issues to reach a defensible model of justice with assistance. (90%)
   Independently apply one or more ethical standards to a novel topic (75%)

3. Incorporate new scientific findings into an ethical deliberation with assistance. (90%)
   Find relevant scientific findings independently and incorporate them into a deliberative process (75%)
   Identify the ethical and scientific considerations in a novel topic. (75%)

C. ASSESSMENT FINDINGS
[This section is optional. Assessment findings can be reported if they are available.]
What were the results/findings, and what is your interpretation/analysis of the data? (Please be detailed, using specific numbers/percentages when possible. Qualitative discussion of themes provided in student feedback can also be reported. Do NOT use course grades or overall scores on a test/essay. The most useful data indicates where students’ performance was stronger and where it was weaker. Feel free to attach charts/tables if desired.)

Please see the attached assessment document.
D. ASSESSMENT FEEDBACK

Given your students’ performance the last time the course was offered, how will you modify the course to enhance learning? You can also address how the course could be improved, and what changes in the course content or pedagogy you plan to make, based upon on the findings. Please include a timeframe for the changes.
A General Education Assessment Report will be due on a four-year rotating cycle. You will be notified in advance of the due date. This will serve to fulfill the University’s accreditation requirements to assess general education and will provide an opportunity to connect with your colleagues across campus and share teaching strategies.

VII. SYLLABUS AND SUBMISSION

Please submit syllabus in a separate file with the completed and signed form to the Faculty Senate Office, UH 221. The learning goals for the Ethics Group must be included on the syllabus. An electronic copy of the original signed form is acceptable.

Please note that this is a substantially revised syllabus and course structure from my 2015 submission. The revisions are based on my own review of the Group VIII criteria, and a useful discussion with Prof. Paul Muench. I have endeavored to expand the explicit treatment of ethics material in part 1 by incorporating two new texts, Justice: What’s the right thing to do?, and primary source readings on ethics from Justice: a reader, and other sources. Furthermore, I have tried to be much more clear about how ethical standards are applied in part 2 by providing example topics, readings, and discussion structure from previous years.
Science and Society

Course requirements: This course will be graded based on, in equal proportion, the midterm score, participation in class discussions including one class that you will moderate in the second half of the term, and a final project consisting of participation in some local or national issue related to science. Examples of possible projects include: a letter to the newspaper, to your Congressional delegation, or to local government representatives; volunteer time with a local advocacy group; a presentation in a local school or to a local group; an organized outreach effort; or another participatory activity (approved by the instructor).

Learning goals: The goals of this course include developing proficiency in the following skills: applying concepts and forms of reasoning to ethical issues in science topics, analyzing and evaluating forms of reasoning, identifying and using traditions of ethical thought, identifying and using traditions in the history of science, and evaluating ethical discourse.

Course structure: The structure of the class is based on Socratic discussion. In the first half of the term, we will alternate between readings from the textbook, which give historical context, and corresponding primary sources writing on ethics. You will be expected to discuss the readings in class in detail, so you should be familiar with the material before our meetings. In the second half of the term, we will use philosophical tools and historical context to discuss urgent modern issues with both ethical and scientific components One class meeting on each topic will be moderated by the instructor and the other by a group of students. Readings or activities in student-run meetings will be chosen by the students.


Instructor: Rebecca Bendick, SC 331
Bendick@mso.umt.edu
406-243-5774
office hours: MF 10:00-12:00 or by appointment

Part 1: history and philosophy of science
Week 1: introduction to ethics
Reading: Sandel chapter 1

Week 2: the ancients
Tuesday: E&C Chapter 1
Thursday: Sandel chapter 8 and excerpt from Aristotle, “Niomachean Ethics” in Justice: a reader
Week 2: the early Christian era and Islamic scholarship
   Tuesday: E&C 2
   Thursday: the Ten Commandments, excerpts from Paul’s Epistles

Week 3: the revival of western science and philosophy
   Tuesday: E&C 3
   Thursday: except from Thomas Aquinas “Summa Part II”

Week 4: Renaissance, exploration, and scientific revolution
   Tuesday: E&C 4
   Thursday: Galileo “Letter to the Grand Duchess Christina”

Week 5: Scientific revolution and modern methods
   Tuesday: E&C 5
   Thursday: excerpt from Locke “Second Treatise of Government” in
   Justice: a reader

Week 6: Enlightenment
   Tuesday: E&C 6
   Thursday: Sandel chapter 2
   Excerpt from Bentham “Principles of Morals and Legislation” and
   from Mill “Utilitarianism” in Justice: a reader

Week 7: Kantian Ethics
   Tuesday: sandel chapter 5
   Thursday: excerpts from Kant “Groundwork for the Metaphysics of
   Morals” and Kant “On the supposed right to lie” in Justice: a reader

Week 8: Modern Ethics
   Tuesday: Sandel chapter 6
   Thursday: excerpts from Rawls “A Theory of Justice” in Justice: a reader

Part 2: modern issues of science and ethics
Note that the specific topics of discussion and materials will be selected by the
instructor and students from current media, but representative examples include
the following:

Week 9: Affirmative action and economic inequality
   Tuesday: Tough, “The Poverty Clinic”
   Thursday: chapter 9 readings in Justice: a reader

Week 10: Migration and refugees
   Tuesday: New Scientist “Why welcoming refugees makes economic
   sense for Europe”
Thursday: BBC The Global Philosopher “Should borders be abolished?”

Week 11: Death and birth
   Tuesday: Radiolab “Playing God”
   Thursday: Radiolab “23 weeks 6 days”

Week 12: Neurology, guilt, and criminality
   Tuesday: Radiolab “Blame”
   Thursday: New scientist “Orchid children”

Week 13: Extraterrestrial life and terraforming
   Tuesday: ted.com “The search for planets beyond our solar system”
   Thursday: Labossisere, “Terraforming Ethics”

Week 14: Human genetic engineering and CRISPR
   Tuesday: New Scientist “First human CRISPR trial given go ahead”
   Thursday: “Gattaca”

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University.
All students need to be familiar with the Student Conduct Code. The Code is available for review online at http://www.umt.edu/SA/VPSA/index.cfm/page/1321.
Assessment report for GEO304: Science and Society

Course description
This course is an introduction to the history of science and corresponding history of ethical traditions in the Western canon, including modern developments. It is divided into two parts, introduction to historical context and primary materials, and then application of ethical principles to modern issues.

Course learning goals
Upon completion of an Ethical and Human Values course, students will be able to:

1. correctly apply the basic concepts and forms of reasoning from the tradition or professional practice they studied to ethical issues that arise within those traditions or practices;
2. analyze and critically evaluate the basic concepts and forms of reasoning from the tradition or professional practice they studied.

These course goals are identical to the general education goals for ethics.

Assessment rubric
The Association of American Colleges and Universities has developed a rubric for assessing ethical reasoning abilities. The rubric has two different areas of assessment that correspond to the two learning goals associated with Ethical and Human Values courses at the University of Montana.

Application of ethical concepts (learning goal 1):
Capstone 4: Student can independently apply ethical perspectives/ concepts to an ethical question, accurately, and is able to consider full implications of the application.
Milestone 3: Student can independently (to a new example) apply ethical perspectives/ concepts to an ethical question, accurately, but does not consider the specific implications of the application.
Milestone 2: Student can apply ethical perspectives/ concepts to an ethical question, independently (to a new example) and the application is inaccurate.
Benchmark 1: Student can apply ethical perspectives/ concepts to an ethical question with support (using examples, in a class, in a group, or a fixed-choice setting) but is unable to apply ethical perspectives/ concepts independently (to a new example).

Evaluation of ethical concepts (learning goal 2):
Capstone 4: Student states a position and can state the objections to, assumptions and implications of and can reasonably defend against the objections to, assumptions and implications of different ethical perspectives/ concepts, and the student's defense is adequate and effective.
Milestone 3: Student states a position and can state the objections to, assumptions and implications of, and respond to the objections to, assumptions and implications of different ethical perspectives/ concepts, but the student’s response is inadequate.
Milestone 2: Student states a position and can state the objections to, assumptions and implications of different ethical perspectives/concepts but does not respond to them (and ultimately objections, assumptions, and implications are compartmentalized by student and do not affect student’s position.)

Benchmark 1: Student states a position but cannot state the objections to and assumptions and limitations of the different perspectives/concepts.

Assessment activities

Students are assessed primarily on learning goal 2 in the first half of the class, and on learning goal 1 in the second half of the class. In each case a combination of informal and formal assessment tools are used:

Part 1

Informal assessment: During each class discussion (each class meeting), the instructor assigns a qualitative value to each student corresponding to their participation in the discussion. There are three possible values, +, 0, and -. A score of + corresponds to active participation demonstrating understanding of and engagement with the material. A score of 0 corresponds to limited participation, mainly suggesting limited engagement with the material. A score of – corresponds to no participation. Students are not penalized for misunderstanding the content if they demonstrate an attempt to understand and effort during the discussion to improve or change their understanding. At the end of part 1, these participation scores are tallied into a composite engagement score.

Formal assessment: A midterm essay assignment requires the students to explain one or more historical ethical concepts, including its relation to the social and intellectual context of the historical period. The essay requires the student to apply the concept to a relevant historical scientific issue.

Part 2

Informal assessment: During each class discussion (each class meeting), the instructor assigns a qualitative value to each student corresponding to their participation in the discussion. There are three possible values, +, 0, and -. A score of + corresponds to active participation demonstrating understanding of and engagement with the material. A score of 0 corresponds to limited participation, mainly suggesting limited engagement with the material. A score of – corresponds to no participation. Students are not penalized for misunderstanding the content if they demonstrate an attempt to understand and effort during the discussion to improve or change their understanding. At the end of part 1, these participation scores are tallied into a composite engagement score.

Formal assessment: The final project for this class requires that the student participate in some activity that represents their position on a modern issue combining science and ethics. Activities may be chosen by the student, but they must include active engagement, such as volunteering with an organization, creating media for open distribution, teaching, or participating in actions calling for justice. The
student is graded based on the relationship of their activities to issues of science and ethics, the level of effort required, and their justification for the position taken.

**Findings and assessment of findings (2015 data)**

**Informal assessment of learning goal 1 (part 2 participation score):**
0/20 scored below the benchmark, 3/20 scored at milestone 1, 4/20 scored at milestone 2, 7/20 scored at milestone 3, and 5/20 scored at the capstone level.

**Formal assessment of learning goal 1 (final project score):**
0/20 scored below the benchmark, 3/20 scored at milestone 1, 4/20 scored at milestone 2, 7/20 scored at milestone 3, and 5/20 scored at the capstone level.

**Informal assessment of learning goal 2 (part 1 participation score):**
0/20 scored below the benchmark, 4/20 scored at milestone 1, 2/20 scored at milestone 2, 5/20 scored at milestone 3, and 8/20 scored at the capstone level.

**Formal assessment of learning goal 2 (midterm essay):**
0/20 scored below the benchmark, 5/20 scored at milestone 1, 6/20 scored at milestone 2, 3/20 scored at milestone 3, and 6/20 scored at the capstone level.

**Action steps**
Data will be used annually to measure future achievements in meeting the general education learning goals. Relatively low scores on the midterm essay may reflect students’ writing ability as well as their achievement of learning goals, so additional resources for help with structuring and writing essays will be provided.