I. ASCRC General Education Form (revised 1/27/11)

Use to propose new general education courses (except writing courses), to change existing gen ed courses and to remove designations for existing gen ed courses.

Note: One-time-only general education designation may be requested for experimental courses (X91- previously X95), granted only for the semester taught. A NEW request must be submitted for the course to receive subsequent general education status.

<table>
<thead>
<tr>
<th>Group (submit separate forms if requesting more than one general education group designation)</th>
<th>III. Language</th>
<th>VII: Social Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>III Exception: Symbolic Systems *</td>
<td>VIII: Ethics &amp; Human Values</td>
<td></td>
</tr>
<tr>
<td>IV: Expressive Arts</td>
<td>IX: American &amp; European</td>
<td></td>
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<tr>
<td>V: Literary &amp; Artistic Studies</td>
<td>X: Indigenous &amp; Global</td>
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<tr>
<td>VI: Historical &amp; Cultural Studies</td>
<td>XI: Natural Sciences w/ lab</td>
<td>X</td>
</tr>
<tr>
<td>XI: Natural Sciences w/out lab</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

*Courses proposed for this designation must be standing requirements of majors that qualify for exceptions to the modern and classical language requirement.

<table>
<thead>
<tr>
<th>Dept/Program</th>
<th>Course Title</th>
<th>Course #</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Arts and Sciences</td>
<td>Integrated Physical Science I</td>
<td>USCN175N</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre- or co-req.: M095</td>
<td>3</td>
</tr>
</tbody>
</table>

II. Endorsement/Approvals

Complete the form and obtain signatures before submitting to Faculty Senate Office.

Please type / print name | Signature | Date
------------------------|-----------|----------
Instructor: Ashley Preston | | |
Phone / Email: x: 7848; ashley.preston@umontana.edu | | |
Program Chair: Cathy Corr | | |
Dean: Barry Good | | |

III. Type of request

<table>
<thead>
<tr>
<th>New</th>
<th>One-time Only</th>
<th>Renew</th>
<th>Change</th>
<th>Remove</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>X</td>
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</tbody>
</table>

Reason for Gen Ed inclusion, change or deletion

Description of change

IV. Description and purpose of new general education course: 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:

http://umt.edu/facultysenate/archives/minutes/gened/GE_preamble.aspx
SCN175N Integrated Physical Science I meets a variety of general education requirements. It is available to students in all majors and is three credits. The course is particularly useful for non-science majors and/or education majors whose knowledge of the practice and principles of science may be limited, and who need to acquire a broad, integrated understanding of the basic concepts of the physical sciences. The course introduces the scientific method as a tool for learning about the natural world, and the student is asked to apply the method to the various problems and observations encountered during the course. Science is presented as a creative, iterative practice that adheres to established rules of investigation and to the demands of reason. Fundamental concepts, principles, theories, and laws are introduced (in qualitative and quantitative forms) with an emphasis on the empirical evidence and reasoning processes that led to their establishment. Students learn to think critically about the meaning and significance of fundamental principles, to connect them to real-world situations, and apply them to everyday life. The course provides students with the skills to continue learning and to investigate the merits of scientific claims encountered in daily experience. The course is designed to promote scientific literacy so that graduates can make informed decisions as professionals, consumers and citizens.

V. Criteria: Briefly explain how this course meets the criteria for the group. See:
http://umt.edu/facultysenate/documents/forms/GE_Criteria5-1-08.aspx

| Courses explore a discipline in the natural sciences and demonstrate how the scientific method is used within the discipline to draw scientific conclusions | SCN175N introduces the fundamental concepts and principles in physics and chemistry. Emphasis is placed on understanding the process of scientific inquiry in general, while the problems and methods (of data collection, analysis, interpretation, and validation) peculiar to each discipline are explored, compared and contrasted. The course takes an interdisciplinary approach to the physical sciences on the premise that since lived experience is not discreet, our understanding of how complex physical, chemical, and environmental systems interact is critical to making informed decisions in our personal lives, the marketplace and the voting booth. |
Courses address the concept of analytic uncertainty and the rigorous process required to take an idea to a hypothesis and then to a validated scientific theory. Because the course emphasizes science as an iterative and ongoing process, one that involves creativity as well as empirical rigor, every effort is made to avoid presenting fundamental principles and laws of each discipline as simply given. Instead, the human story behind some of the major findings in each discipline is presented. In this way, the student begins to appreciate that science is an imperfect process that proceeds with little assurance of success or a prescient understanding of the ultimate implications of new findings.

This method of presentation further allows the student to see how an observation or simple question might be formulated into a testable hypothesis, how an experiment or series of experiments might be designed to test the hypothesis, how the test results are interpreted (and some of the difficulties in interpreting ambiguous data), and how interpretations, once used to make successful predictions, can lead to the articulation of theories and laws—both of which are provisional and subject to continued testing.

Lab courses engage students in inquiry-based learning activities where they formulate a hypothesis, design an experiment to test the hypothesis, and collect, interpret, and present the data to support their conclusions. SCN175N is a non-lab course.

<table>
<thead>
<tr>
<th>VI. Student Learning Goals: Briefly explain how this course will meet the applicable learning goals. See: <a href="http://umt.edu/facultysenate/documents/forms/GE_Criteria5-1-08.aspx">http://umt.edu/facultysenate/documents/forms/GE_Criteria5-1-08.aspx</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Understand the general principles associated with the discipline(s) studied</td>
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<td>Understand the methodology and activities scientists use to gather, validate and interpret data related to natural processes</td>
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<td>The chronology of the development of key ideas and theories in the disciplines illustrates how scientific practice proceeds and scientific knowledge is accumulated and negotiated. In many instances, alternative hypotheses are presented so that students understand that the most successful explanation of the phenomena wasn’t necessarily the only one proposed at the outset. Students are then expected to use these rudimentary historical models of scientific process as a basis for the consideration of the current state of scientific understanding and inquiry.</td>
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<tr>
<td>A key asset in achieving this learning objective is the peer-reviewed journal article summary assignments. These summaries require the student to read scientific articles and identify the hypothesis, explain the design of the experiment or field study (selection of test subjects, variables, control groups, methods of data collection, margins of error, technologies employed, etc.), summarize the data, explain how the data is interpreted and conclusions drawn. Special attention is given to the researchers’ own articulation of levels of uncertainty and margins of errors.</td>
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</tbody>
</table>
Detect patterns, draw conclusions, develop conjectures and hypotheses, and test them by appropriate means and experiments

| The scientific method and the steps that a researcher goes through in the process of enquiry and validation are illustrated time and again in the way that the textbook presents key concepts in a discipline, the way the material is presented in lectures, and in demonstrations. The intent is to show the student that though enquiry can begin in many ways, the standards for validation once a hypothesis is formulated are rigorous and the methods or steps are clearly established by the scientific community to ensure reproducibility.

Students are expected to demonstrate their understanding of the steps and their functions in the scientific method in the journal article summary exercises. The articles themselves illustrate the process of scientific enquiry and theory-making. By asking students to summarize these findings, and then by using their reports as the basis for discussion, students have the opportunity to engage with the research process and theory-making in the scientific community. In many instances, the studies summarized have inconclusive results or results which contradict other studies. These provide real opportunities for students to examine the patterns and facts in each case and develop hypotheses that might be tested and to accept that scientists often express a level of uncertainty with respect either to the data or its interpretation. This often leads students to follow the developments in the field to see if their conjectures were correct. |
| Understand how scientific laws and theories are verified by quantitative measurement, scientific observation, and logical/critical reasoning | Students are not asked to accept on faith any law or theory. Rather, the processes by which major theories were developed and verified are presented so that students have a chance to evaluate for themselves the interplay between observation/measurement, reason, and critical analysis. Quantitative data that supports a particular model or law is presented in a fashion that allows students to examine it for ambiguity making it clear that conclusions drawn from this data depend in part on human reason and the rules of logic. Student summaries of science journal articles often report new developments in our understanding of fundamental theories or report surprising results that cannot be explained by current theories. These articles serve as the springboard for discussion that deepens understanding of the principles involved and the logical reasoning which might be followed to bring the ‘old’ views into alignment with the ‘new realities’. |
Understand the means by which analytic uncertainty is quantified and expressed in the natural sciences

The method of presentation as well as the summary assignments are designed to help students to learn to recognize how levels of confidence are reported in scientific findings. Students are encouraged to investigate the level of certainty and precision that attends any particular experimental process and interpretation of the data, and to explore the difficulties of drawing conclusions from ambiguous data. To do this, students must learn to distinguish clearly between data or facts and interpretation of the facts; or between the role of observation and measurement and that of reason.

Discussion of current issues, such as fossil fuel supplies, climate change, or human impacts on natural systems inevitably result in examination of current analytic and empirical models of complex systems. Over the course of the semester developments that support or contradict the dominant explanatory models are in the news. Students with particular points of view are eager to try to use the new data to support their view and to argue that the uncertainty of the model they prefer is less. Contrary points of view using the same or other data are proffered by other students or instructors and generally students realize more research must be done to achieve unequivocal results.

VII. Justification: 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 above the 200 level), provide rationale for exception(s).

SCN175N has only one pre- or co-requisite: M095

VIII. Syllabus: Paste syllabus below or attach and send digital copy with form. The syllabus should clearly describe how the above criteria are satisfied. For assistance on syllabus preparation see: http://teaching.berkeley.edu/bgd/syllabus.html
INTEGRATED PHYSICAL SCIENCE I
SCN175N
COURSE SYLLABUS

Course Title: SCN 175N Integrated Physical Science I
Semester Credits: 3
Professor: Ashley Preston
Office: HB Building “Office”/HB02, College of Technology
Phone: 243-7848; no message function
Email: ashley.preston@umontana.edu THIS is the best way to communicate with me
Office Hours: MWF noon-1:00 or by appointment

Course Description: SCN175N Integrated Physical Science I, 3cr. Offered every term. Co- or pre-req.: M095. An introduction to the fundamental principles of physics and chemistry with an emphasis on the scientific method and process.

Course Overview: The course offers an introduction to the scientific method as a tool for understanding natural phenomena. The course begins with an examination of the scientific method, introducing students to methods of observation, data collection, experimentation, validation, interpretation, and theory building. Science is presented as an ongoing process, one that aims to construct a seamless web of knowledge about the workings of the world around us and the universe as a whole. SCN175 takes an integrated approach to the presentation of basic concepts and principles in physics and chemistry. Topics emphasized include: mechanics, energy and thermodynamics, electricity and magnetism, waves and electromagnetic radiation, the atom, quantum mechanics, basic chemistry, and the atomic nucleus. In each instance, connections between the branches of science are emphasized, focusing on real-world situations and applications.


Student Learning Outcomes: Upon completion of this course, the student will be able to:
1. Understand and critically evaluate the merit of basic scientific claims and/or findings encountered in education, the workplace, the marketplace, or the media.
2. Identify and differentiate between observations, hypotheses, theories, and laws (e.g., to understand the scientific method and its relationship to creativity, logic, and intuition).
3. Gather information, interpret observations, and quantify data on natural phenomena.
4. Recognize patterns in natural processes and structures; formulate and test elementary predictions based on pattern recognition; draw conclusions and construct hypotheses and/or theories.
5. Understand the meaning and broader significance of the basic principles and concepts of the major scientific disciplines.
6. Make connections between the different sciences to construct an integrated web of knowledge about the natural world.
7. Apply scientific methods and principles to real-world situations; assess the social, economic, political, environmental, and ethical impacts of scientific findings or research agendas.

Drop/Add Policy
You may wish to consult the university catalogue and calendar for important dates and policies.
http://www.umt.edu/catalog/acad/acadpolicy/default.html

Student Conduct Code
In an effort to ensure that students are informed about the consequences of academic misconduct, the Academic Officers of The University of Montana have determined that the following statement must be present on every course syllabus. You will be held to these standards in this course.

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.

Course Accommodations Statement (DSS)
Students with disabilities may request reasonable modifications by contacting me. The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students (DSS). “Reasonable” means the University permits no fundamental alterations of academic standards or retroactive modifications. (For other options see http://www.umt.edu/disability). Make an appointment or stop by during office hours to bring me your form and discuss accommodations.

Email policy at UM
According to the University email policy effective on 1 July 2007, an “employee must use only UM assigned student email accounts for all email exchanges with students, since such communication typically involves private student information.” This means that you must send any correspondence through your official UM student email account. For more information on setting up and using your official UM email account contact tech support.

Assessment Methods and Grading
1. Six Unit Tests. Exams cannot be made up without prior approval. You must contact me in advance of the exam date to make arrangements to take the exam prior to the regularly scheduled time.
2. Projects/Homework
   - Scientist bio sketch (1)
   - Science Journal Article Summaries (5).
   - Science News Final Project (1)
   - Other work as assigned
Note: Late assignments are not accepted. You will receive a 0 for any assignment not submitted by the due date and time.
3. Attendance/participation
For online students participation is measured by the frequency and quality of contributions to the Discussion Board (quantity will not replace quantity; consult the grading rubric for details), and timely completion of ALL work.
For face to face students, attendance is required and participation in class is strongly recommended; both will impact grades. Your final grade will drop one full letter after 4 unexcused absences (i.e., upon the 5th unexcused absence)
4. Comprehensive Final Exam. The final is cumulative.

<table>
<thead>
<tr>
<th></th>
<th>Points</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Tests (6) (drop lowest score)</td>
<td>500</td>
<td>50%</td>
</tr>
<tr>
<td>Homework</td>
<td>250</td>
<td>25%</td>
</tr>
<tr>
<td>Participation</td>
<td>50</td>
<td>5%</td>
</tr>
<tr>
<td>Comprehensive Final Exam</td>
<td>200 points</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>1000 points</td>
<td>100%</td>
</tr>
</tbody>
</table>

Grading Scale
A- - A = 90 - 100
B- - B = 80 - 89
C- - C = 70 – 79
D- - D = 60 – 69
F = 59 and below

Topical Outline SCN 175N
Scientific Method and Process
Energy
Wave Motions and Sounds
Light
Mechanics
Heat and Temperature
Electricity
Atoms and Periodic Properties
Chemical Reactions
Nuclear Reactions
Water and Solutions
Please note: Approved general education changes will take effect next fall.

General education instructors will be expected to provide sample assessment items and corresponding responses to the Assessment Advisory Committee.