MATHEMATICS AND SCIENCE DUAL, MINOR

This minor may be completed only by students admitted to the Middle Childhood through Early Adolescence options of Elementary Education. Students may wish to consult with an advisor in Education Academic Services, 139 Education Building, 608-262-1651, to discuss course selection and other issues related to this field of study.

HOW TO GET IN

This minor may be completed only by students admitted to the Middle Childhood through Early Adolescence options of Elementary Education. Students admitted to the Content Focus option (http://guide.wisc.edu/undergraduate/education/curriculum-instruction/elementary-education-bse/elementary-education-middle-childhood-through-early-adolescence-content-focused-minor-bse) are asked to identify the minor of their choice when admitted to the program. Students admitted to the other Middle Childhood through Early Adolescence options should fill out a minor declaration form available in Education Academic Services, Room 139 Education Building.

REQUIREMENTS

This minor is intended for Elementary Education majors wishing to enhance their content preparation in mathematics and science and is particularly suitable for Elementary Education majors who intend to teach mathematics and science in the middle school.

A minimum cumulative grade point average of 2.75 is required, based on all minor coursework taken on the UW–Madison campus.

MATHMATICS COMPONENT

The mathematics sequence emphasizes problem solving, mathematical reasoning and justification, communicating, and building on students’ mathematical ideas in areas such as algebraic thinking, calculus, and probability and statistics. The capstone course, MATH 138, is for students to build connections across core ideas in upper-level elementary and middle school mathematics and to understand how these evolve from and into elementary and higher level mathematics. This sequence is also intended to prepare students to take the Praxis examination for middle school mathematics, thereby permitting certification and licensure in most other states that require more in-depth content preparation.

Complete the following courses. Students completing this minor will take MATH 135 instead of MATH 132 in the Elementary Education sequence.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 135</td>
<td>Algebraic Reasoning for Teaching Math¹</td>
<td>3</td>
</tr>
<tr>
<td>MATH 136</td>
<td>Pre-calculus and Calculus for Middle School Teachers ²</td>
<td>6</td>
</tr>
<tr>
<td>MATH 138</td>
<td>Mathematics for Teaching: Conjecture, Generalization, and Proof³</td>
<td>3</td>
</tr>
</tbody>
</table>

¹ Offered each spring semester. For more detailed information about MATH 135, see this website (http://www.math.wisc.edu/%7Elempp/ed.html).
² This is a 6-credit course based on the large lecture of MATH 171 Calculus with Algebra and Trigonometry I with a special discussion section for students completing this minor. Offered each fall semester. The following students will be exempt from this course requirement: students having taken MATH 213, MATH 217, MATH 221, MATH 222, MATH 234, MATH 275, MATH 276, or MATH 375 (or an exact transfer equivalent of any of these) with a grade of B or better; students having passed the AP Calculus AB test with a score of 5; and students having passed the AP Calculus BC test with a score of 4 or better.
³ This 3-credit capstone course is similar to MATH 132.

SCIENCE COMPONENT

The aim of the science component of this minor is for students to understand science as an intellectual activity. The goals of science and the diverse means by which scientific knowledge is generated and validated should be at the core of the science portion of this minor. Upon its completion, students should have had opportunities to understand some of the most powerful organizing ideas in the various scientific disciplines as well as how those ideas have been and are generated. Such an understanding should provide students with the fundamental tools and outlook necessary to teach the variety of science content typically taught in middle schools.

The committee that developed this science component has indicated that the primary purpose for the minor should be consistent with the goals of a liberal or general education, thus viewing the minor as an extension of the current liberal studies requirement. In addition to the 9 credits of science required for the liberal studies requirement, students completing this minor must also take 9 credits in science for the math—science dual minor. With these 18 credits it is possible to provide a minimal level of breadth and depth of science coursework. This minor is also expected to provide Elementary Education program students with a background in the sciences that are most commonly taught at the middle school level.

Complete the following requirements:

- At least 18 credits from the courses listed below. Additional courses can be considered; please consult with an advisor in Education Academic Services.
- One course in each of three of the four science areas of biology, chemistry, physics, and earth and space science from the approved list, below. Integrated Liberal Studies 153 does not count in any of the areas, but can count toward the 18 credit total.
- At least 6 credits of coursework from the courses listed below that are not marked with an asterisk (*). Courses with the asterisk are considered to be introductory level courses.

The following courses are approved for inclusion in the science component of the math/science minor.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>ILS 153</td>
<td>Ways of Knowing in the Sciences*</td>
<td>4</td>
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Biology course options

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>All courses numbered 500 and above</td>
<td></td>
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</tbody>
</table>
Biocore
All courses

Biology
BIOLOGY/animal biology  3
ZOOLOGY 101
BIOLOGY/animal biology laboratory  2
ZOOLOGY 102
BIOLOGY/BOTANY/zoology  5
INTRODUCTORY BIOL 151
BIOLOGY/BOTANY/zoology  5
INTRODUCTORY BIOL 152

Botany
BOTANY 100 survey of botany  3
BOTANY/plants, parasites, and people  3
PL PATH 123
BOTANY/general botany  5
BIOLOGY 130

Entomology
ENTOM/insects and human culture-a  3
ENVR ST 201 survey course in entomology

Forest and Wildlife Ecology
All courses numbered 300 and above

Genetics
All courses numbered 400 and above

Microbiology
MICROBIO 101 general microbiology  3
MICROBIO 102 general microbiology laboratory  2

Plant Pathology
PL PATH/plants, parasites, and people  3
BOTANY 123
All courses numbered 300 and above

Zoology
ZOOLOGY/animal biology  3
BIOLOGY 101
ZOOLOGY/animal biology laboratory  2
BIOLOGY 102
ZOOLOGY/BOTANY/zoology  5
INTRODUCTORY BIOL 151
ZOOLOGY/BOTANY/zoology  5
INTRODUCTORY BIOL 152
ZOOLOGY/BOTANY/ENVR ST 260
ZOOLOGY/ENTOM 302
ZOOLOGY/ENVR ST 315

Chemistry course options
Code | Title | Credits
---|---|---
CHEM 103 | General Chemistry I  | 4
CHEM 104 | General Chemistry II | 5
CHEM 108 | Chemistry in Our World  | 5
CHEM 109 | Advanced General Chemistry  | 5
CHEM 115 | Chemical Principles I | 5
CHEM 116 | Chemical Principles II  | 5

Physics course options
Code | Title | Credits
---|---|---
PHYSICS 103 | General Physics  | 4
PHYSICS 104 | General Physics  | 4
PHYSICS 107 | The Ideas of Modern Physics  | 3

Earth and Space Science course options
Code | Title | Credits
---|---|---
ASTRON 100 | * | 4
ASTRON 103 | The Evolving Universe: Stars, Galaxies, and Cosmology  | 3
ASTRON 104 | Our Exploration of the Solar System  | 3
ASTRON 113 | Hands on the Universe (Only if taken concurrently with ASTRON 103)  | 1
ASTRON 114 | Hands on the Solar System (Only if taken concurrently with ASTRON 104)  | 1
ASTRON 150 | Topics in Astronomy  | 2
ASTRON 200 | The Physical Universe  | 3
ASTRON 236 | The History of Matter in the Universe  | 3

Atmospheric and Oceanic Studies
Code | Title | Credits
---|---|---
ATM OCN 100 | Weather and Climate  | 3
ATM OCN 101 | Weather and Climate  | 4
ATM OCN/ENVR ST/GEOSCI 102 | Climate and Climate Change  | 3
ATM OCN/GEOSCI 105 | Survey of Oceanography  | 3-4
ATM OCN/ENVR ST 171 | Global Change: Atmospheric Issues and Problems  | 2-3

Geography
Code | Title | Credits
---|---|---
GEOG/ENVR ST 120 | Introduction to the Earth System  | 3
<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG/ENVIR ST 127</td>
<td>Physical Systems of the Environment *</td>
<td>5</td>
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</tbody>
</table>

All courses numbered 300 and above and designated as
Physical Science

**Geoscience**

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>GEOSCI 100</td>
<td>Introductory Geology: How the Earth Works *</td>
<td>3</td>
</tr>
<tr>
<td>GEOSCI/ATM OCN/ENVIR ST 102</td>
<td>Climate and Climate Change *</td>
<td>3</td>
</tr>
<tr>
<td>GEOSCI/ATM OCN 105</td>
<td>Survey of Oceanography *</td>
<td>3-4</td>
</tr>
<tr>
<td>GEOSCI 107</td>
<td>Life of the Past *</td>
<td>3</td>
</tr>
<tr>
<td>GEOSCI 110</td>
<td>Evolution and Extinction *</td>
<td>4</td>
</tr>
<tr>
<td>GEOSCI 202</td>
<td>Introduction to Geologic Structures</td>
<td>4</td>
</tr>
<tr>
<td>GEOSCI 203</td>
<td>Earth Materials</td>
<td>5</td>
</tr>
<tr>
<td>GEOSCI 204</td>
<td>Geologic Evolution of the Earth</td>
<td>4</td>
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<tr>
<td>GEOSCI 302</td>
<td>Physics and Chemistry of the Earth's Interior</td>
<td>3</td>
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<tr>
<td>GEOSCI 303</td>
<td>Fluids and Sedimentary Processes</td>
<td>3</td>
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<tr>
<td>GEOSCI 304</td>
<td>Geobiology</td>
<td>3</td>
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<tr>
<td>GEOSCI/GEOG 320</td>
<td>Geomorphology</td>
<td>3</td>
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<tr>
<td>GEOSCI/G LE 370</td>
<td>Elementary Petrology</td>
<td>3</td>
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<tr>
<td>GEOSCI/GEOG 420</td>
<td>Glacial and Pleistocene Geology</td>
<td>3</td>
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<tr>
<td>GEOSCI 430</td>
<td>Sedimentology and Stratigraphy</td>
<td>3</td>
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<tr>
<td>GEOSCI/G LE 455</td>
<td>Structural Geology</td>
<td>4</td>
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<tr>
<td>GEOSCI 456</td>
<td>Geologic Field Methods</td>
<td>2</td>
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<tr>
<td>GEOSCI/GEOG 524</td>
<td>Advanced Landform Geography</td>
<td>3</td>
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<tr>
<td>GEOSCI/GEOG 527</td>
<td>The Quaternary Period</td>
<td>3</td>
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All courses numbered 556 and above