## Curriculum Proposal

**BIOL 17-18 #17**

<table>
<thead>
<tr>
<th>1.3 Summary</th>
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</table>

**New Program**

1.5 Biochemistry, Cellular and Molecular Biology, B.S. major Cellular and Molecular emphasis

1.5 Biochemistry, Cellular and Molecular Biology, B.S. major Biochemistry emphasis

**Course Modifications**

1.21 BIOL 2360 Genetics (4 credits); prerequisite change

1.25 BIOL 3250/5250 Comparative Vertebrate Anatomy (4 credits) to Human Anatomy; description and prerequisite change

1.28 BIOL 3260/5260 Medical Physiology (4 credits) to Human Physiology; prerequisite change

1.30 BIOL 3380/5380 Molecular Genetics: Theory and Practice (4 credits) to Molecular Genetics (3 credits); description and prerequisite change

1.33 BIOL 3580/5580 Immunology (4 credits) to Immunology (3 credits)

1.35 BIOL 3590/5590 Cell Biology (4 credits) to Cell Biology (3 credits); description change

1.37 BIOL 4360/5360 Developmental and Tumor Biology (4 credits) to Developmental and Tumor Biology (3 credits); description and prerequisite change

**New Courses**

1.39 BCMB 1000 Biochemistry, Cell and Molecular Biology Careers (BCMB Careers) (1 credit)

1.44 BCMB 3000 Biochemistry, Cell and Molecular Biology Research (BCMB Research) (1 credit)

1.48 BCMB 3074/BIOL 3074 Molecular Techniques (2 credits)

| 1.53 BCMB 3075/BIOL 3075 Cellular Techniques (2 credits) |
| 1.58 BCMB 3076/ CHEM 3076 Biochemical Techniques (2 credits) |
| 1.61 BIOL 4460/5460 Stem Cells and Regenerative Medicine (3 credits) |
| 1.69 BIOL 4470/5470 Introduction to Vaccinology (4 credits) |
| 1.79 BIOL 4715 Clinical Microbiology (3 credits) |
| 1.84 CHEM 4614/5614 Medicinal Chemistry: Drug Design (3 credits) |
| 1.92 CHEM 4615/5615 Medicinal Chemistry: Drug Action (3 credits) |
| 1.102 CHEM 4894 Research I (2 credits) |
| 1.105 CHEM 4895 Research II (2 credits) |

**Program Modifications**

1.116 Biology, B.S. major Cellular and Molecular emphasis

1.124 Biology, B.S. major Medical Sciences emphasis

1.132 Chemistry, B.S. major Biochemistry/Biotechnology emphasis

1.137 Chemistry, B.S. major Criminalistics emphasis

1.142 Medical Laboratory Science, B.S. major 3+1 option

1.152 Medical Laboratory Science, B.S. major 4+1 option

1.162 Signatures
Curriculum Proposal

Biochemistry, Cellular, and Molecular Biology (BCMB)
B.S. Major

PROPOSERS

Department of Biology
Mark Wallert, Associate Professor
Mike Hamann, Professor
Holly LaFerriere, Assistant Professor

Department of Chemistry
Katie Peterson, Assistant Professor
Ken Traxler, Professor
A note to reviewers: In this curriculum packet, the curriculum modification summary (form 1) is followed by the new program form (form 6). Form 6 provides an overview of the proposed Biochemistry, Cellular, and Molecular Biology (BCMB) major and presents the structure for the core BCMB seminar, techniques, and research courses. Subsequent forms present the course modifications (form 2) and new courses (form 3) that support this major.
BSU Curriculum Forms

Form 1

Curriculum Modification Summary

College: Arts and Sciences
Departments: Chemistry and Biology
Proposers and Proposer Positions:
- Mark Wallert (Associate Professor, Biology)
- Mike Hamann (Professor, Biology)
- Holly LaFerriere (Assistant Professor, Biology)
- Ken Traxler (Professor, Chemistry)
- Katie Peterson (Assistant Professor, Chemistry)

Describe the modification(s) you propose, and how it (/they) will work to students’ advantage. (This description and explanation will be included in Curriculum Report packets forwarded to the Faculty Senate.):

The departments of biology and chemistry propose an interdisciplinary biochemistry, cellular and molecular biology (BCMB) major. This major is designed to recruit students with pre-health (medicine, dental, pharmacy, physical therapy, etc.) and biomedical research interests. Currently, students with these interests pursue either a Biology degree with a Cellular and Molecular emphasis or a Chemistry degree with a Biochemistry emphasis. Generating a major, as opposed to an emphasis, with a title reflective of their degree is a major advantage to students.

The research-based nature of this program will better train students to enter careers in biotechnology and biomedical science, as well as facilitate their acceptance into graduate or professional schools. A laboratory rich curriculum is proposed that develops central techniques in core courses that are applied in senior (“capstone”) research projects. Further, the new curriculum better aligns with concepts emphasized on the Medical College Admissions Test (MCAT). Two seminar courses will build community among the students, introduce career options, and assist students in designing senior research projects. This latter component serves to improve retention and allow students to discover alternative career paths in biochemistry, cellular, and molecular biology.

Modifications proposed (specify number of each):
- 7 Course Modification(s) (form 2): 7 from BIOL
- 12 New Course(s) (form 3): 5 from BCMB, 3 from BIOL, 4 from CHEM
- ___ Course Drop(s) (form 4):
- 6 Program Modification(s) (form 5)
- 1 New Program(s) (form 6): for the BCMB program
- ___ Program Drop(s) (form 7)
The modifications affect (check):

_____ Liberal Education
_X_ Undergraduate Curriculum
_X_ Graduate Curriculum
_____ Teacher Licensure Program(s)
BSU Curriculum Forms

Form 6
(Updated: 9.15.15)

New Program Form

Type of Program to be established:

- M.S.*
- M.A.*
- Applied Masters**
- B.S.
- B.S./T.L.
- B.A.
- Minor
- Field of Emphasis: Stand Alone
- Field of Emphasis in:
- Other:

Program name: Biochemistry, Cellular and Molecular Biology (BCMB)

Reason(s) for new program:

BSU currently serves Minnesota and the national/international community by providing separate majors in Biology and Chemistry, each with distinct sub-disciplines in the majors. Both majors have seen growth in the students pursuing careers related to biochemistry and cellular/molecular sciences, including pre-professional (medical, dental, pharmacy, physical therapy, etc). These students have generally pursued two academic directions within the Biology and Chemistry departments. One program has been the Cellular and Molecular Biology Emphasis within the Biology BS degree programs, and the other has been the Chemistry major with a Biochemistry emphasis. Most students pursuing one of these degrees also choose to major or minor in the complementary program.

While the two programs have been sufficient to meet the needs of many students, a more unified curriculum provided by a Biochemistry, Cellular and Molecular Biology (BCMB) major would offer a more focused, intentional curriculum to support multiple career directions in the field and enhance student employability. In particular, a more structured approach to training students for undergraduate research can be built into the core requirements of the program, and should better prepare students for careers, graduate school, and professional programs after undergraduate.

Having a single degree program will have the capacity to attract and better train students interested in a life science or biotechnology related career, but will also attract and retain students seeking development in the pre-professional programs offered at BSU, especially the Pre-Med, Pre-Pharmacy, and Pre-Physician’s Assistant programs. Pre-Med students would be
particularly well served by the new major as the Medical College Admissions Test (MCAT) has now changed its format in order to test biochemistry and related concepts much more thoroughly, reflecting the importance of this knowledge base in the professional medical field. Additionally, student applications to medically-related graduate programs (medical school, physician’s assistant graduate school, etc.) are significantly improved when the student has independent research experience.

Overall, the BCMB major is a laboratory-rich, research-based program designed to prepare students for graduate school, professional school, or careers in industry. The sequence of seminars, techniques courses and senior capstone research experiences are designed to introduce students to the tools and techniques used in BCMB research and optimize the productivity of the senior research experience. The course sequence includes:

<table>
<thead>
<tr>
<th>Semester / Year</th>
<th>Course</th>
<th>Course Objectives</th>
</tr>
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</table>
| Spring Freshman Year | BCMB 1000: BCMB Careers | • Required Course  
• Introduce BCMB career options  
• Design Academic Plan |
| Spring Sophomore Year | BCMB/BIOL 3074: Molecular Techniques | • Required Course  
• Introduce theory and practice of specific molecular techniques  
• Build common laboratory skill set |
| Fall Junior Year | BCMB/BIOL 3075: Cellular Techniques | • One of two electives in the Techniques Core  
• Introduce theory and practice of cellular techniques and cell-based assays.  
• Ensure students interested in cellular research have techniques required for a successful senior research project. |
| Spring Junior Year | BCMB/CHEM 3076: Biochemical Techniques | • One of two electives in the Techniques Core  
• Introduce theory and practice of biochemical techniques and instrumentation.  
• Ensure students interested in biochemical research have techniques required for a successful senior research project. |
| Spring Junior Year | BCMB 3000: BCMB Research | • Required Course  
• Introduce ethical conduct in scientific research  
• Select faculty mentor for senior research  
• Design research project |
| Senior Year | BIOL 4894: Advanced Research Projects I  
BIOL 4895: Advanced Research Projects II | • One of two elective sequences for senior research  
• Enrollment dependent upon the home department of the faculty mentor. |
| Senior Year | CHEM 4894: Research I  
CHEM 4895: Research II | • One of two elective sequences for senior research  
• Enrollment dependent upon the home department of the faculty mentor. |
The BCMB major will also be an important recruitment tool for attracting new students to BSU. Perspective students visiting the University and communicating with faculty in the Biology and Chemistry Departments often are seeking a biochemistry major or closely similar degree program, but express uncertainty about pursuing a Cellular and Molecular Biology or Biochemistry emphasis versus a major. Additionally, while BSU attracts students from many parts of the state, the largest student population at BSU is recruited from the Iron Range, Arrowhead, and north-central regions of the state. Within this area, the single largest institution with a biochemistry major is the University of Minnesota, Duluth. The BCMB major at BSU would provide a high-quality and competitive alternative to UMD, especially when considering a current annual tuition of about $12,000 at UMD versus the approximately $8,000 tuition bill at BSU.

Additional expenses for undertaking the new degree program are expected to be minimal, and the program will better capitalize on faculty expertise within the Biology and Chemistry departments. Drs. Hamann, LaFerriere, Peterson, Traxler, and Wallert, along with a replacement anatomy/physiology hire within the Biology department and Dr. Arsham with the BSU/North Hennepin Community College program, will form the core members of the program. Except for a few new courses, the major will largely consist of courses already taught by these instructors. The new courses specifically designed for the major are anticipated to fit within the current faculty’s load and will not pose a financial burden to the University in the form of new faculty.

As a combination of biology and chemistry, the BCMC major will represent a significant interdisciplinary program in the form of a shared major. The major has the potential of being a substantial benefit to bioscience students seeking a variety of career opportunities, while better promoting faculty talents and recruiting students to BSU.

**Student learning outcomes for the program (please use the same format as for other programs in the department):**

Students graduating from the BSU Biochemistry, Cellular and Molecular Biology program will:

1. Understand fundamental chemical, molecular, cellular, and systems level scientific concepts, but also formulate specialized knowledge within the program’s chemical or cellular tracks.
2. Acquire basic research skills in introductory courses and refine those skills in advanced courses and independent research.
3. Demonstrate ability to design and conduct independent research.
4. Apply critical thinking and quantitative skills to evaluate scientific information.
5. Practice effective oral and written communication of scientific ideas in the manner of professional scientists.
6. Be prepared for medical, professional, and graduate schools, as well as entry into biotechnology industry careers.
How will the student learning outcomes be assessed (e.g., major field test, student portfolio, departmental rubric, department-developed examination questions, etc.)?

At the program level, student learning outcomes will be assessed using three main mechanisms.

1. Student learning outcomes 1 will be assessed using a final, summative exam prior to a student’s graduation. The exam will consist of a series of faculty-developed questions that will test at two levels:
   - Foundational material reflecting core knowledge learned at the freshman/sophomore level.
   - In depth comprehension of materials from areas of focus within the major.

2. Student learning outcomes 2-5 represent a larger overall goal of the BCMB program to foster a student’s capacity to conduct independent research. These research related goals include developing a hypothesis driven project, engaging in research under faculty mentorship, and presenting results in a poster or oral presentation format in a public forum, as well as presenting the results in an appropriate written format. Student learning outcomes 2-5 will be performed as a single assessment using a rubric for scoring a presentation or paper, as agreed upon by the student and the faculty mentor during their final year in the program.

3. Student learning outcome 6 relates to the development of a student’s career plan and will be initially introduced and developed during their freshman year within the context of the BCMB 1000 Careers seminar course, a new course to be offered as part of the degree program. After this initial plan assessment, additional advising relating to career directions and opportunities will occur later in the program through student/faculty advising sessions, allowing students to refine their career goals as they matriculate through the program. As a final career-based assessment, the students will be asked to report their post-graduation career plans during the summative exam (see above).

Note: If courses from other departments are required for this program, please notify the chairs of those departments.

The home department/program was notified that this new program will require courses from their area: 11/14/2017 (date) by email (mail, email, or phone).

Please check one of the items below:

_____ No comments were received from other programs or departments within one week of the notification.

X Comments were received within one week of the notification, and are attached. Comments from Dr. Derek Webb, Chair of the Department of Mathematics and Computer Science and Dr. John Truedson, Chair of the Department of Physics are below.
Monday 11/20/2017 8:43 AM

Dear Katie, our department is in receipt of this curriculum proposal and we discussed it at our department meeting on Thursday, November 16, 2017. We have no concerns.

Derek

Dr. Derek Webb
Professor of Statistics and Mathematics
Department Chair
Bemidji State University Faculty Association President
Department of Mathematics and Computer Science
Bemidji State University
304 Hagg Sauer Hall
1500 Birchmont Dr. NE 23
Bemidji, MN 56601-2699

Office: 218-755-2846
Fax: 218-755-2822
email: dwebb@bemidjistate.edu

Tuesday 11/14/2017 1:09 PM

Ok. Thanks for the update

J. Truedson

On Nov 14, 2017, at 12:45 PM, Katie Peterson <KPeterson@bemidjistate.edu> wrote:

Dr. Webb and Dr. Truedson,

Please find the attached curriculum proposal for an interdisciplinary Biochemistry, Cellular, and Molecular Biology (BCMB) major. We wanted to alert you of this proposal as this new major requires students to take courses in your representative departments.

The catalog format of the major (attached) provides a quick overview. No new math or physics requirements are included in the BCMB degree compared to the current Biology, Cellular and Molecular emphasis or the Chemistry, Biochemistry emphasis. The requirements include:

- PHYS 1101 and 1102 or PHYS 2101 and 2102
- MATH 2471 or STAT 2610

We appreciate any comments you may have on this proposal and its potential impact on your departments.

Sincerely,
Katie Peterson
Note: If this is a joint program, the signatures of both department chairs (and both deans, if different colleges) must be provided.

Alerts:
- Attach draft catalog copy of proposed program.
  - See following pages. A suggested 4 year course schedule is also included.
- Contact the Assistant Vice-President for Academic Affairs regarding approval downstate (required for all of the above except for a minor where there is an existing major).
  - Dr. Randy Westhoff was contacted by email on Nov 14, 2017.

Dr. Westhoff,

Please find the attached curriculum proposal for an interdisciplinary Biochemistry, Cellular, and Molecular Biology (BCMB) major. We wanted to communicate with you about the progress of this proposal as this new program will require downstate approval. Are you aware of any forms or process guidelines regarding MinnState approval? We have yet to receive any guidance on this aspect of the process.

Thank you,

Katie Peterson

* MS/MA Curriculum proposals for graduate programs must indicate how the program addresses these requirements (in the draft catalog copy or elsewhere):

a. MnSCU 50% rule: At least one-half of the required credits in a master's degree, exclusive of a thesis, capstone, or similar culminating project, shall be credits restricted exclusively to graduate student enrollment.

b. Competency Requirement

c. Written Examination Requirement

**Applied Master’s Degree must address items a-c above, as well as:

  d. How the proposed capstone experience meets the capstone requirements/standards listed in the catalog.

For more information on each of these requirements refer to the current graduate catalog.
Program Summary: Biochemistry, Cellular and Molecular Biology, B.S. major

Required credits: 76-81 cr
Required GPA: 2.25

I REQUIRED COURSES – 59-61 cr

Biochemistry Core – 18 cr
- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 3380 Molecular Genetics (3 credits)
- BIOL 3590 Cell Biology (3 credits)
- BIOL 3710 Microbiology (4 credits)

Chemistry Core – 23 cr
- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- CHEM 3311 Organic Chemistry I (3 credits)
- CHEM 3312 Organic Chemistry II (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)
- CHEM 3372 Organic Chemistry Laboratory II (1 credit)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)
- CHEM 4412 Biochemistry II (3 credits)

Related Field Requirements – 8-10 cr
Select 1 of the following groups:
- GROUP 1:
  - PHYS 1101 General Physics I (4 credits)
  - PHYS 1102 General Physics II (4 credits)
- GROUP 2:
  - PHYS 2101 Physics I (5 credits)
  - PHYS 2102 Physics II (5 credits)

Seminars – 2 cr
- BCMB 1000 BCMB Careers (1 credit)
- BCMB 3000 BCMB Research (1 credit)

Techniques Core (2 courses) – 4 cr
Complete the following courses:
- BCMB 3074 Molecular Techniques (2 credits)
  or BIOL 3074 Molecular Techniques (2 credits)

Select 1 of the following:
- BCMB 3075 Cellular Techniques (2 credits)
  or BIOL 3075 Cellular Techniques (2 credits)
- BCMB 3076 Biochemical Techniques (2 credits)
  or CHEM 3076 Biochemical Techniques (2 credits)

Research – 4 cr
Select 1 of the following groups:
- GROUP 1:
  - BIOL 4894 Advanced Research Project I (2 credits)
  - BIOL 4895 Advanced Research Project II (2 credits)
- GROUP 2:
  - CHEM 4894 Research I (2 credits)
  - CHEM 4895 Research II (2 credits)
II REQUIRED EMPHASIS – Cellular and Molecular Biology – 17-22 cr

Biology Electives (3 courses) – 9-12 cr
- BIOL 3580 Immunology (3 credits)
- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3250 Human Anatomy (4 credits)
- BIOL 3260 Human Physiology (4 credits)
- BIOL 4270 Histology (4 credits)
- BIOL 4360 Developmental and Tumor Biology (3 credits)
- BIOL 4447 Genomics (3 credits)
- BIOL 4460 Stem Cells and Regenerative Medicine (3 credits)
- BIOL 4470 Introduction to Vaccinology (4 credits)
- BIOL 4715 Clinical Microbiology (3 credits)

Chemistry Electives – 4-6 cr
Select 1 of the following groups
GROUP 1:
- CHEM 3507 Analytical Chemistry (3 credits)
- CHEM 3570 Analytical Chemistry Laboratory (1 credit)
GROUP 2:
- CHEM 4614 Medicinal Chemistry: Drug Design (3 credits)
- CHEM 4615 Medicinal Chemistry: Drug Action (3 credits)

Related Field Requirements (1 course) – 4 cr
- STAT 2610 Applied Statistics (4 credits)

II REQUIRED EMPHASIS – Biochemistry – 22-23 cr

Chemistry: Complete the following courses – 10 cr
- CHEM 3507 Analytical Chemistry (3 credits)
- CHEM 3570 Analytical Chemistry Laboratory (1 credit)
- CHEM 4614 Medicinal Chemistry: Drug Design (3 credits)
- CHEM 4615 Medicinal Chemistry: Drug Action (3 credits)

Chemistry Electives (1 course, 1 lab) – 4 cr
Select 1 of the following groups
GROUP 1:
- CHEM 4510 Instrumental Methods of Analysis (3 credits)
- CHEM 4571 Instrumental Analysis Laboratory I (1 credit)
GROUP 2:
- CHEM 4711 Physical Chemistry I (3 credits)
- CHEM 4771 Physical Chemistry Laboratory I (1 credit)
GROUP 3:
- CHEM 4811 Advanced Inorganic Chemistry I (3 credits)
- CHEM 4871 Inorganic Chemistry Laboratory I (1 credit)

Biology Electives (1 course) – 3-4 cr
- BIOL 3580 Immunology (3 credits)
- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3250 Human Anatomy (4 credits)
- BIOL 3260 Human Physiology (4 credits)
- BIOL 4270 Histology (4 credits)
- BIOL 4360 Developmental and Tumor Biology (3 credits)
- BIOL 4447 Genomics (3 credits)
- BIOL 4460 Stem Cells and Regenerative Medicine (3 credits)
- BIOL 4470 Introduction to Vaccinology (4 credits)
- BIOL 4715 Clinical Microbiology (3 credits)

Related Field Requirements (1 course) – 5 cr
- MATH 2471 Calculus I (5 credits)
Biochemistry, Cellular and Molecular Biology, B.S. *major*

Proposed Course Schedules

**CELLULAR AND MOLECULAR BIOLOGY EMPHASIS (76 – 83 credits)**

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<th>Term / Year</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td><strong>Freshman</strong></td>
<td>8 credits</td>
<td>9 credits</td>
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<tr>
<td>BIOL 1211 Intro to Biology I (4 cr)</td>
<td>BIOL 2360 Genetics (4 cr)</td>
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<tr>
<td>CHEM 2211 Principles Chem I (4 cr)</td>
<td>CHEM 2212 Principles Chem II (4 cr)</td>
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<tr>
<td></td>
<td>BCMB 1000 BCMB Careers (1 cr)</td>
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<tr>
<td><strong>Sophomore</strong></td>
<td>11 - 12 credits</td>
<td>13 - 14 credits</td>
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<tr>
<td>BIOL 3590 Cell Biology (3 cr)</td>
<td>BIOL 3380 Molecular Genetics (3 cr)</td>
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<tr>
<td>CHEM 3311 Organic Chem I (4 cr)</td>
<td>CHEM 3312 Organic Chem II (4 cr)</td>
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<tr>
<td>PHYS 1101/2101 Physics I (4 - 5 cr)</td>
<td>BCMB/BIOL 3074 Molecular Techniques (2 cr)</td>
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<tr>
<td></td>
<td>PHYS 1102/2102 Physics II (4 - 5 cr)</td>
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<tr>
<td><strong>Junior</strong></td>
<td>10 credits</td>
<td>11 - 12 credits</td>
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<tr>
<td>BIOL 3710 Microbiology (4 cr)</td>
<td>CHEM 4412 Biochem II (3 cr)</td>
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<tr>
<td>CHEM 4411 Biochem I (4 cr)</td>
<td>BCMB 3000 BCMB Research Prep (1 cr)</td>
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<tr>
<td>BCMB/BIOL 3075 Cellular Techniques (2 cr)</td>
<td>Bio Elective (3 - 4 cr)</td>
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<td></td>
<td>STAT 2610 Applied Stats (4 cr)</td>
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<tr>
<td><strong>Senior</strong></td>
<td>8 – 9 credits</td>
<td>8 – 9 credits</td>
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<tr>
<td>BIOL 4894 Advanced Projects I (2 cr)</td>
<td>BIOL 4895 Advanced Projects II (2 cr)</td>
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<tr>
<td>CHEM 4614 Med Chem Drug Design (3 cr)*</td>
<td>CHEM 4615 Med Chem Drug Action (3 cr)*</td>
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<tr>
<td>Bio Elective (3 - 4 cr)</td>
<td>Bio Elective (3 – 4 cr)</td>
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*This can drop to 76 credits if substitute Analytical Chem and Lab for the two Med Chem Courses.*
## BIOCHEMISTRY EMPHASIS (81 – 84 credits)

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<th>Fall</th>
<th>Spring</th>
</tr>
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<tbody>
<tr>
<td><strong>Freshman</strong></td>
<td>8 credits</td>
<td>14 credits</td>
</tr>
<tr>
<td></td>
<td>BIOL 1211 Intro to Biology I (4 cr)</td>
<td>MATH 2471 Calculus I (5 cr)</td>
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<tr>
<td></td>
<td>CHEM 2211 Principles Chem I (4 cr)</td>
<td>BIOL 2360 Genetics (4 cr)</td>
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<tr>
<td></td>
<td></td>
<td>CHEM 2212 Principles Chem II (4 cr)</td>
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<tr>
<td></td>
<td></td>
<td>BCMB 1000 BCMB Careers (1 cr)</td>
</tr>
<tr>
<td><strong>Sophomore</strong></td>
<td>12 credits</td>
<td>13 credits</td>
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<tr>
<td></td>
<td>BIOL 3590 Cell Biology (3 cr)</td>
<td>BIOL 3380 Molecular Genetics (3 cr)</td>
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<td>CHEM 3311 Organic Chem I (4 cr)</td>
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<td>MATH 2472 Calculus II (5 cr)</td>
<td>BCMB/Biol 3074 Molecular Techniques (2 cr)</td>
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<tr>
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<td>CHEM 3507 Analytical Chem (4 cr)</td>
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<tr>
<td><strong>Junior</strong></td>
<td>13 credits</td>
<td>11 credits</td>
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<tr>
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<td>BIOL 3710 Microbiology (4 cr)</td>
<td>CHEM 4412 Biochem II (3 cr)</td>
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<td>CHEM 4411 Biochem I (4 cr)</td>
<td>BCMB 3000 BCMB Research Prep (1 cr)</td>
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<tr>
<td></td>
<td>PHYS 2101 Physics I (5 cr)</td>
<td>BCMB/CHEM 3076 Biochemical Techniques (2 cr)</td>
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<td></td>
<td>PHYS 2102 Physics II (5 cr)</td>
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<tr>
<td><strong>Senior</strong></td>
<td>9 credits</td>
<td>8 – 9 credits</td>
</tr>
<tr>
<td></td>
<td>CHEM 4894 Chem Research I (2 cr)</td>
<td>CHEM 4895 Chem Research II (2 cr)</td>
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<tr>
<td></td>
<td>CHEM 4614 Med Chem Drug Design (3 cr)</td>
<td>CHEM 4615 Med Chem Drug Action (3 cr)</td>
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<tr>
<td></td>
<td>Chem Elective (4 cr)</td>
<td>Bio Elective (3 – 4 cr)</td>
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</tbody>
</table>
Draft catalog copy of proposed program

Biochemistry, Cellular and Molecular Biology, B.S. major
(For the Cellular and Molecular Biology emphasis)

Required credits: 76 cr
Required GPA: 2.25

I REQUIRED COURSES

Biology Core
Complete the following courses:
- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 3380 Molecular Genetics (3 credits)
- BIOL 3590 Cell Biology (3 credits)
- BIOL 3710 Microbiology (4 credits)

Chemistry Core
Complete the following courses:
- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- CHEM 3311 Organic Chemistry I (3 credits)
- CHEM 3312 Organic Chemistry II (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)
- CHEM 3372 Organic Chemistry Laboratory II (1 credit)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)
- CHEM 4412 Biochemistry II (3 credits)

Related Field Requirements
Select 1 of the following groups:
- **GROUP 1:**
  - PHYS 1101 General Physics I (4 credits)
  - PHYS 1102 General Physics II (4 credits)

- **GROUP 2:**
  - PHYS 2101 Physics I (5 credits)
  - PHYS 2102 Physics II (5 credits)

Seminars
Complete the following courses:
- BCMB 1000 BCMB Careers (1 credit)
- BCMB 3000 BCMB Research (1 credit)

Techniques Core
Complete the following courses:
- BCMB 3074 Molecular Techniques (2 credits)
  or BIOL 3074 Molecular Techniques (2 credits)

Select 1 of the following:
- BCMB 3075 Cellular Techniques (2 credits)
  or BIOL 3075 Cellular Techniques (2 credits)
- BCMB 3076 Biochemical Techniques (2 credits)
  or CHEM 3076 Biochemical Techniques (2 credits)

Research
Select 1 of the following groups:
GROUP 1:
- BIOL 4894 Advanced Research Project I (2 credits)
- BIOL 4895 Advanced Research Project II (2 credits)

GROUP 2:
- CHEM 4894 Research I (2 credits)
- CHEM 4895 Research II (2 credits)

II REQUIRED EMPHASIS – Cellular and Molecular Biology
Biology Electives:
Select 3 courses
- BIOL 3580 Immunology (3 credits)
- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3250 Human Anatomy (4 credits)
- BIOL 3260 Human Physiology (4 credits)
- BIOL 4270 Histology (4 credits)
- BIOL 4360 Developmental and Tumor Biology (3 credits)
- BIOL 4447 Genomics (3 credits)
- BIOL 4470 Introduction to Vaccinology (4 credits)
- BIOL 4715 Clinical Microbiology (3 credits)

Chemistry Electives
Select 1 of the following groups
GROUP 1:
- CHEM 3507 Analytical Chemistry (3 credits)
- CHEM 3570 Analytical Chemistry Laboratory (1 credit)

GROUP 2:
- CHEM 4614 Medicinal Chemistry: Drug Design (3 credits)
- CHEM 4615 Medicinal Chemistry: Drug Action (3 credits)

Related Field Requirements
Complete the following:
- STAT 2610 Applied Statistics (4 credits)

SUGGESTED SEMESTER SCHEDULE FOR BIOCHEMISTRY, CELLULAR, AND MOLECULAR BIOLOGY, B.S. MAJOR – CELLULAR AND MOLECULAR BIOLOGY emphasis

Note:
For purposes of this proposal the suggested semester schedule below only lists the course subject and number; however, the course catalog will include the subject, number, title and credits for each course.

Freshman:
- BIOL 1211
- CHEM 2211
- BIOL 2360
- CHEM 2212
- BSMB 1000

Sophomore:
- BIOL 3590
- CHEM 3311
- PHYS 1101 or PHYS 2101
- BIOL 3380
- CHEM 3312
• BCMB 3074 or BIOL 3074
• PHYS 1102 or PHYS 2102

**Junior:**
• BIOL 3710
• CHEM 4411
• BCMB 3075 or BIOL 3075
• CHEM 4412
• BCMB 3000
• Emphasis Biology elective
• STAT 2610

**Senior:**
• BIOL 4894
• BIOL 4895
• Emphasis Chemistry elective(s)
• Emphasis Biology electives
Draft catalog copy of proposed program

Biochemistry, Cellular and Molecular Biology, B.S. major
(For the Biochemistry emphasis)

Required credits: 81 cr
Required GPA: 2.25

I REQUIRED COURSES –

Biology Core
Complete the following courses
- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 3380 Molecular Genetics (3 credits)
- BIOL 3590 Cell Biology (3 credits)
- BIOL 3710 Microbiology (4 credits)

Chemistry Core
Complete the following courses
- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- CHEM 3311 Organic Chemistry I (3 credits)
- CHEM 3312 Organic Chemistry II (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)
- CHEM 3372 Organic Chemistry Laboratory II (1 credit)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)
- CHEM 4412 Biochemistry II (3 credits)

Related Field Requirements
Select 1 of the following groups:
GROUP 1:
- PHYS 1101 General Physics I (4 credits)
- PHYS 1102 General Physics II (4 credits)

GROUP 2:
- PHYS 2101 Physics I (5 credits)
- PHYS 2102 Physics II (5 credits)

Seminars
Complete the following courses
- BCMB 1000 BCMB Careers (1 credit)
- BCMB 3000 BCMB Research (1 credit)

Techniques Core
Complete the following courses
- BCMB 3074 Molecular Techniques (2 credits)
- or BIOL 3074 Molecular Techniques (2 credits)

Select 1 of the following:
- BCMB 3075 Cellular Techniques (2 credits)
- or BIOL 3075 Cellular Techniques (2 credits)
- BCMB 3076 Biochemical Techniques (2 credits)
- or CHEM 3076 Biochemical Techniques (2 credits)

Research
Select 1 of the following groups:

GROUP 1:
- BIOL 4894 Advanced Research Project I (2 credits)
- BIOL 4895 Advanced Research Project II (2 credits)

GROUP 2:
- CHEM 4894 Research I (2 credits)
- CHEM 4895 Research II (2 credits)

II REQUIRED EMPHASIS – Biochemistry

Chemistry:
Complete the following courses
- CHEM 3507 Analytical Chemistry (3 credits)
- CHEM 3570 Analytical Chemistry Laboratory (1 credit)
- CHEM 4514 Medicinal Chemistry: Drug Design (3 credits)
- CHEM 4615 Medicinal Chemistry: Drug Action (3 credits)

Chemistry Electives
Select 1 of the following groups

GROUP 1:
- CHEM 4510 Instrumental Methods of Analysis (3 credits)
- CHEM 4571 Instrumental Analysis Laboratory I (1 credit)

GROUP 2:
- CHEM 4711 Physical Chemistry I (3 credits)
- CHEM 4771 Physical Chemistry Laboratory I (1 credit)

GROUP 3:
- CHEM 4811 Advanced Inorganic Chemistry I (3 credits)
- CHEM 4871 Inorganic Chemistry Laboratory I (1 credit)

Biology Electives
Select 1 of the following
- BIOL 3580 Immunology (3 credits)
- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3250 Human Anatomy (4 credits)
- BIOL 3260 Human Physiology (4 credits)
- BIOL 4270 Histology (4 credits)
- BIOL 4360 Developmental and Tumor Biology (3 credits)
- BIOL 4447 Genomics (3 credits)
- BIOL 4460 Stem Cells and Regenerative Medicine (3 credits)
- BIOL 4470 Introduction to Vaccinology (4 credits)
- BIOL 4715 Clinical Microbiology (3 credits)

Related Field Requirements
Complete the following
- MATH 2471 Calculus I (5 credits)

SUGGESTED SEMESTER SCHEDULE FOR BIOCHEMISTRY, CELLULAR, AND MOLECULAR BIOLOGY, B.S. MAJOR

Biochemistry emphasis

Note:
For purposes of this proposal the suggested semester schedule below only lists the course subject and number; however, the course catalog will include the subject, number, title and credits for each course.

Freshman:
- BIOL 1211
- CHEM 2211
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<th>Sophomore:</th>
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<tbody>
<tr>
<td>BIOL 3590</td>
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<td>CHEM 3311</td>
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<tr>
<td>MATH 2472</td>
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<tr>
<td>BCMB 3074 or BIOL 3074</td>
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<tr>
<td>CHEM 3507</td>
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<table>
<thead>
<tr>
<th>Junior:</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 3710</td>
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<td>CHEM 4411</td>
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<tr>
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<tr>
<td>CHEM 4412</td>
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<tr>
<td>BCMB 3000</td>
</tr>
<tr>
<td>BCMB 3076 or CHEM 3076</td>
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<tr>
<td>PHYS 2102</td>
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<table>
<thead>
<tr>
<th>Senior:</th>
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<tbody>
<tr>
<td>CHEM 4894</td>
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<td>CHEM 4895</td>
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<tr>
<td>CHEM 4615</td>
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<tr>
<td>Emphasis Chemistry elective(s)</td>
</tr>
<tr>
<td>Emphasis Biology elective</td>
</tr>
</tbody>
</table>
BSU Curriculum Forms

Form 2

Course Modification Form
Current Course Number(s):
  Undergraduate: **BIOL 2360**
  Graduate:
Proposed Course Number(s), if different:
  Undergraduate:
  Graduate:

Current Course Title: **Genetics**
Proposed Course Title, if different:

Current Course Description: **Fundamental principles of heredity in plants, animals, and microorganisms. Includes both classical and molecular genetic approaches to studying organisms.**
Prerequisites: **BIOL 1211 and BIOL 1212.**

Note: Only change is to the prerequisites
Proposed Course Description, if different: **Fundamental principles of heredity in plants, animals, and microorganisms. Includes both classical and molecular genetic approaches to studying organisms.**
Prerequisites: **BIOL 1211.**

Current Credits: **4**
Proposed Credits, if different:

Current Prerequisite(s): **Prerequisites: BIOL 1211 and BIOL 1212.**
Proposed Prerequisite(s), if different: **BIOL 1211**

1) Reason(s) for change(s): **BIOL 1212 does not provide materials that are essential to the topics covered in BIOL 2360 Genetics.**

2) May this modified course replace the current course for students remaining in the old curriculum? Yes _X__ No _____ If not, please drop the current course and submit a new course form for the modification.

3) Do these modifications change any of the following? **For all Yes answers, please provide updated information on the next page.**
   - Student Learning Outcomes Yes _____ No _X__
   - Major Content Areas Yes _____ No _X__
   - Projected Maximum Class Size (Cap) Yes _ _ No _X__

4) Current Course fee(s) per student: **$15 per credit**
for: Biology approved differential tuition fees.
Proposed Course fee(s) per student, if different: $

for:

5) Service Areas:

Note: Non-licensure programs are from the proposing departments so notification N/A

This course is a requirement or an elective in the programs/areas listed below. To locate where this course appears please search the online catalog, as follows:

a) go to [http://www.bemidjistate.edu/academics/catalog/](http://www.bemidjistate.edu/academics/catalog/) and choose the most recent catalog(s),

b) click on “Areas of Study, and Course Descriptions;”

c) click on “PDF of Entire Catalog” in upper right,

d) press Ctrl F, and enter the prefix and number of the course(s) from this form.

Non-licensure programs:

* Aquatic Biology, BS major Wetlands emphasis
* Aquatic Biology, BS major Fisheries emphasis
* Aquatic Biology, BS major Aquatic emphasis
* Biology, B.A. major
* Biology, BS major Cellular and Molecular emphasis
* Biology, BS major Medical Sciences emphasis
* Wildlife Biology, BS major
* Biology minor
* Chemistry, BS major Biochemistry/Biotechnology emphasis
* Medical Lab Science (3+1) major – Note: not in program but in suggested schedule
* Medical Lab Science (4+1) major
* Pre-Chiropractic
* Pre-Pharmacy
* Pre-Physician Assistant
* Pre-Veterinary Medicine

Teacher Licensure programs:

* Science Education, Life Science Specialty (Teacher Licensure)

Liberal Education:

The above “service area” programs/departments were notified of this modification on ___11/14/17___ & ___2/21/18___ (date) by _____ email ________ (mail, email, or phone).

Please check one of the items below:

_____ No comments were received from other programs or departments within one week of the notification.

___X___ Comments were received within one week of the notification, and are attached.
Sounds good, Mike. Thank you for letting me know.

Mike

From: Michael Hamann  
Sent: Tuesday, November 14, 2017 10:28 AM  
To: Michael Urban  
Subject: FYI-Genetics

Hi Mike,
I’m just sending this email to let you know that I’m changing the pre-requisites for Genetics, but it shouldn’t have any real effect on the Life Science major. Currently the pre-requisites are 1211 and 1212, but I’m dropping the 1212 requirement. Genetics is initially covered in 1211, with no additional content in 1212. I’m making this change to prepare for a biochemistry major that we’re hoping to offer by next year.

Let me know if you have any concerns.

Thanks!
Mike

Michael Hamann, Ph.D.  
Biology Department  
Bemidji State University  
1500 Birchmont Dr. NE, Box 27  
Bemidji, MN  56601

Office: Sattgast Hall, 218M  
Email: mhamann@bemidjistate.edu  
Phone: (218) 755-2798

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From: Timothy Goodwin  
Sent: Wednesday, February 21, 2018 12:21 PM  
To: Robin Gullickson <RGullickson@bemidjistate.edu>  
Subject: RE: Curriculum Proposal: question re: Science Education Life Science specialty course

I approve

From: Robin Gullickson  
Sent: Wednesday, February 21, 2018 12:06 PM  
To: Timothy Goodwin <TGoodwin@bemidjistate.edu>  
Subject: Curriculum Proposal: question re: Science Education Life Science specialty course  
Importance: High
Hi Tim,

The Biol/Chem departments are putting through a curriculum proposal. One of the course modifications is to change the prerequisites for BIOL 2360 from BIOL 1211, BIOL 1212 to just BIOL 1211. This is a required course in the Science Education Life Science specialty major.

The proposers received approval from Mike Urban for this change but I also wanted to check with you to find out if you also need to weigh in on this since it is an education major?

Thank you, Tim –

Robin Gullickson
Assistant Registrar | Curriculum Coordinator
ext.4248 | rgullickson@bemidjistate.edu
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
  Undergraduate:  BIOL 3250
  Graduate:      BIOL 5250

Proposed Course Number(s), if different:
  Undergraduate:
  Graduate:

Current Course Title:  Comparative Vertebrate Anatomy
Proposed Course Title, if different:  Human Anatomy

Current Course Description:
Classification, adaptation, and evolutionary history of vertebrates; anatomy and functional morphology of vertebrates, including humans. Lecture and Laboratory. Prerequisites: BIOL 1211 and BIOL 1212.

Proposed Course Description, if different:
Anatomical structure of the human body, from individual organ systems to the integrated whole. BIOL 1211.

Current Credits: 4 credits
Proposed Credits, if different:

Current Prerequisite(s):
  Undergraduate:  BIOL 1211
  Graduate:      NONE

Proposed Prerequisite(s), if different:
  Undergraduate:
  Graduate:

1) Reason(s) for change(s):

To make curriculum consistent with current admissions requirements for professional school in the areas of medicine, physician assistant, physical therapy and others.

2) May this modified course replace the current course for students remaining in the old curriculum? Yes  X  No. If not, please drop the current course and submit a new course form for the modification.
3) Do these modifications change any of the following? **For all Yes answers, please provide updated information on the next page.**

- Student Learning Outcomes: Yes X No ___ (see end of Form 2)
- Major Content Areas: Yes X No ___ (see end of Form 2)
- Projected Maximum Class Size (Cap): Yes ___ No X

4) Current Course fee(s) per student: $15 per credit
   for: **Biology approved differential tuition fees.**
   Proposed Course fee(s) per student, if different: $
   for:

5) Service Areas:

   **None – All Non-licensure programs are from the proposing departments so notification N/A**

   This course is a requirement or an elective in the programs/areas listed below. To locate where this course appears please search the online catalog, as follows:
   a) go to [http://www.bemidjistate.edu/academics/catalog/](http://www.bemidjistate.edu/academics/catalog/) and choose the most recent catalog(s),
   b) click on “Areas of Study, and Course Descriptions,”
   c) click on “PDF of Entire Catalog” in upper right,
   d) press Ctrl F, and enter the prefix and number of the course(s) from this form.

   Non-licensure programs:
   * Biology, B.A. major
   * Biology, B.S. major
   * Biology, B.S. major Medical Sciences emphasis (optional)
   * Biology minor
   * Pre-Chiropractic
   * Pre-Osteopathic Medicine
   * Pre-Podiatric Medicine
   * Pre-Veterinary Medicine

   Teacher Licensure programs:

   Liberal Education:

   The above “service area” programs/departments were notified of this modification on _______ (date) by ___________________ (mail, email, or phone).

   Please check one of the items below:
   ______ No comments were received from other programs or departments within one week of the notification.
   ______ Comments were received within one week of the notification, and are attached.
Updated Student Learning Outcomes:

Students will:

- learn basic anatomy at cellular and tissue level including the similarities and differences of the 4 basic tissues of the body.
- learn anatomical structures of organs and organ systems for integument, skeletal, muscle, digestive, respiratory, cardiovascular, lymphatic, reproductive and nervous.
- learn basic functions of each of the organs and organ systems described for integument, skeletal, muscle, digestive, respiratory, cardiovascular, lymphatic, reproductive and nervous.
- prepare for careers in health and medical sciences.

Updated Major Content Areas:

- The course will now focus exclusively on human anatomy and will no longer include the comparative vertebrate anatomy component.
Course Modification Form

Current Course Number(s):
  Undergraduate: BIOL 3260
  Graduate: BIOL 5260

Proposed Course Number(s), if different:
  Undergraduate:
  Graduate:

Current Course Title: Medical Physiology
Proposed Course Title, if different: Human Physiology

Current Course Description:
Physiological and pathophysiological principles and control mechanisms of organ systems within humans. Lecture and laboratory. Prerequisites: BIOL 1211, BIOL 1212, BIOL 3250, and CHEM 3312.

Note: Only change is to the prerequisites
Proposed Course Description, if different:
Physiological and pathophysiological principles and control mechanisms of organ systems within humans. Lecture and laboratory. Prerequisites: BIOL 1211, CHEM 3312.

Current Credits: 4 credits
Proposed Credits, if different:

Current Prerequisite(s):
  Undergraduate: BIOL 1211, BIOL 1212, BIOL 3250, and CHEM 3312.
  Graduate: NONE

Proposed Prerequisite(s), if different:
  Undergraduate: BIOL 1211, CHEM 3312.
  Graduate:

1) Reason(s) for change(s):

To make curriculum consistent with current admissions requirements for professional school in the areas of medicine, physician assistant, physical therapy and others.
2) May this modified course replace the current course for students remaining in the old curriculum?  
Yes ___ X ___ No _____ If not, please drop the current course and submit a new course form for the modification.

3) Do these modifications change any of the following? **For all Yes answers, please provide updated information on the next page.**

   - Student Learning Outcomes Yes _____ No ___ X___
   - Major Content Areas Yes _____ No ___ X___
   - Projected Maximum Class Size (Cap) Yes _____ No ___ X___

4) Current Course fee(s) per student: $15 per credit
   for: **Biology approved differential tuition fees.**
   Proposed Course fee(s) per student, if different: $    
   for:

5) Service Areas:
   - None
   - All Non-licensure programs are from the proposing departments so notification N/A

This course is a requirement or an elective in the programs/areas listed below. To locate where this course appears please search the online catalog, as follows:

   a) go to [http://www.bemidjistate.edu/academics/catalog/](http://www.bemidjistate.edu/academics/catalog/) and choose the most recent catalog(s),
   b) click on “Areas of Study, and Course Descriptions,”
   c) click on “PDF of Entire Catalog” in upper right,
   d) press Ctrl F, and enter the prefix and number of the course(s) from this form.

   - Non-licensure programs:
     * Biology, B.A. major
     * Biology, B.S. major Cellular and Molecular emphasis (optional)
     * Biology, B.S. major
     * Biology, B.S. major Medical Sciences emphasis (optional)
     * Biology minor

   - Teacher Licensure programs:

   - Liberal Education:

The above “service area” programs/departments were notified of this modification on ______ (date) by ____________________ (mail, email, or phone).

Please check one of the items below:

   - No comments were received from other programs or departments within one week of the notification.
   - Comments were received within one week of the notification, and are attached.
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
   Undergraduate:  BIOL 3380
   Graduate:  BIOL 5380

Proposed Course Number(s), if different:
   Undergraduate:
   Graduate:

Current Course Title:  Molecular Genetics: Theory and Practice
Proposed Course Title, if different:  Molecular Genetics

Current Course Description:  Study of the structure, replication, repair, expression, regulation, and change of genetic material. Introduction to theory and procedures by which recombinant DNA molecules are formed, cloned, and expressed. Lecture and laboratory. Prerequisites: BIOL 1211 and BIOL 1212. Might not be offered every year.

Proposed Course Description, if different:  Study of the structure, replication, repair, expression, regulation, and change of genetic material. Introduction to theory and procedures by which recombinant DNA molecules are formed, cloned, and expressed. Prerequisites: BIOL 1211 and BIOL 2360.

Current Credits: 4
Proposed Credits, if different: 3

Current Prerequisite(s):
   Undergraduate:  BIOL 1211 and BIOL 1212
   Graduate:  NONE
Proposed Prerequisite(s), if different:
   Undergraduate:  BIOL 1211 and BIOL 2360
   Graduate:

1) Reason(s) for change(s):
   1. Name shortened to what the course is typically called and more streamlined.
   2. Alteration in course description reflects the removal of the lab portion of the course, as a new Molecular Techniques course will be offered that will cover this content.
   3. Removal of the lab portion warrants the decrease in credits from 4 to 3.

2) May this modified course replace the current course for students remaining in the old curriculum?
Yes  X  No  If not, please drop the current course and submit a new course form for the modification.
3) Do these modifications change any of the following? **For all Yes answers, please provide updated information on the next page.**

- Student Learning Outcomes: Yes __X__ No ___
- Major Content Areas: Yes __X__ No ___
- Projected Maximum Class Size (Cap): Yes ___ No __X__

4) Current Course fee(s) per student: **$15 per credit**
for: **Biology approved differential tuition fees.**
Proposed Course fee(s) per student, if different: $
for:

5) Service Areas:

**None – programs are all within proposing departments so service notifications N/A**

This course is a requirement or an elective in the programs/areas listed below. To locate where this course appears please search the online catalog, as follows:

a) go to [http://www.bemidjistate.edu/academics/catalog/](http://www.bemidjistate.edu/academics/catalog/) and choose the most recent catalog(s),
b) click on “Areas of Study, and Course Descriptions,”
c) click on “PDF of Entire Catalog” in upper right,
d) press Ctrl F, and enter the prefix and number of the course(s) from this form.

- Non Licensure programs:
  - * Biology, B.S. Cellular and Molecular emphasis
  - * Biology, B.S. Medical Sciences emphasis
  - * Biology, B.A.
  - * Biology, B.S.
  - * Medical Laboratory Science (3+1)
  - * Medical Laboratory Science (4+1)
  - * Biology minor
  - * Chemistry, B.S. Criminalistics emphasis

- Teacher Licensure programs:

Liberal Education:

The above “service area” programs/departments were notified of this modification on __________ (date) by ____________________ (mail, email, or phone).

Please check one of the items below:

- _____ No comments were received from other programs or departments within one week of the notification.
- _____ Comments were received within one week of the notification, and are attached.
Alterations in Student Learning Outcomes reflect the removal of the lab portion of the course:

From:

1. Identify and explain the major genetic information pathways, including replication, repair, transcription, RNA processing and translation.
2. Compare and contrast the primary and higher order structures of DNA, RNA, and proteins.
3. Examine the applications of molecular genetics in medicine, agriculture, industry, and forensics.
4. Evaluate primary research articles that describe seminal discoveries in molecular genetics.
5. Develop basic molecular lab skills, including pipetting, DNA and RNA isolation, PCR and molecular cloning.
6. Practice standard laboratory operating procedures, including lab safety, preparation and handling of samples, maintenance of a lab notebook and the importance of standards and controls.

To:

1. Identify and explain the major genetic information pathways, including replication, repair, transcription, RNA processing and translation.
2. Compare and contrast the primary and higher order structures of DNA, RNA, and proteins.
3. Examine the applications of molecular genetics in medicine, agriculture, industry, and forensics.
4. Evaluate primary research articles that describe seminal discoveries in molecular genetics.

Alterations in Major Content Areas:

All hands on lab work will be performed in the Molecular Techniques course (BIOL/BCMB 3074) separate from the Molecular Genetics course.
BSU Curriculum Forms

Form 2

Course Modification Form

Current Course Number(s):
Undergraduate: BIOL 3580
Graduate: BIOL 5580

Proposed Course Number(s), if different:
Undergraduate:
Graduate:

Current Course Title: Immunology
Proposed Course Title, if different:

Current Course Description: The study of disease fighting mechanisms of the body. Lecture and laboratory. Prerequisites: BIOL 2360 or BIOL 3380, and one year of chemistry.
Proposed Course Description, if different: The study of disease fighting mechanisms of the innate and adaptive immune systems. Prerequisites: BIOL 2360 and one year of chemistry.

Current Credits: 4
Proposed Credits, if different: 3

Current Prerequisite(s): BIOL 2360 or BIOL 3380, and one year of chemistry.
Proposed Prerequisite(s), if different: BIOL 2360 and one year of chemistry.

1) Reason(s) for change(s): The lab portion of the class is being separated from the lecture portion as part of the curriculum changes associated with the Biochemistry, Cellular and Molecular Biology degree.

2) May this modified course replace the current course for students remaining in the old curriculum? Yes _X_ No ____ If not, please drop the current course and submit a new course form for the modification.

3) Do these modifications change any of the following? For all Yes answers, please provide updated information on the next page.
   - Student Learning Outcomes __Yes_____ No _X_
   - Major Content Areas __Yes_____ No _X_
   - Projected Maximum Class Size (Cap) __Yes__ No _X_

4) Current Course fee(s) per student: $0
for:
Proposed Course fee(s) per student, if different: $
for:

5) Service Areas:

NONE – all programs are within the proposing departments so service notifications N/A

This course is a requirement or an elective in the programs/areas listed below. To locate where this course appears please search the online catalog, as follows:
  a) go to http://www.bemidjistate.edu/academics/catalog/ and choose the most recent catalog(s),
  b) click on “Areas of Study, and Course Descriptions,”
  c) click on “PDF of Entire Catalog” in upper right,
  d) press Ctrl F, and enter the prefix and number of the course(s) from this form.

  Non-licensure programs:
  * Medical Laboratory Science B.S. major 3+1
  * Medical Laboratory Science B.S. major 4+1
  * Chemistry, B.S. major Biochemistry/Biotechnology emphasis
  * Biology, B.S. major Cellular and Molecular emphasis
  * Biology, B.S. major Medical Sciences emphasis
  * Biology, B.A. major
  * Biology, B.S. major
  * Biology minor

  Teacher Licensure programs:

  Liberal Education:

The above “service area” programs/departments were notified of this modification on ________ (date)
by ______________ (mail, email, or phone).

Please check one of the items below:

______ No comments were received from other programs or departments within one week of the notification.

______ Comments were received within one week of the notification, and are attached.
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
   Undergraduate: BIOL 3590
   Graduate: BIOL 5590

Proposed Course Number(s), if different:
   Undergraduate:
   Graduate:

Current Course Title: Cell Biology
Proposed Course Title, if different:

Current Course Description:
Microscopic anatomy and physiological mechanisms of plant and animal cells. Gene control of cellular metabolism, mechanism of energy utilization in cells and pathways of synthesis of molecules. Lecture and laboratory. Prerequisites: BIOL 2360 or BIOL 3380; and CHEM 2211, CHEM 2212.

Proposed Course Description, if different:
Microscopic anatomy and physiological mechanisms of plant and animal cells. Gene control of cellular metabolism, mechanism of energy utilization in cells and pathways of synthesis of molecules. Prerequisites: (BIOL 2360 or BIOL 3380) and (CHEM 2211, CHEM 2212) or consent of instructor.

Current Credits: 4 credits
Proposed Credits, if different: 3 credits

Current Prerequisite(s):
   Undergraduate: (BIOL 2360 or BIOL 3380) and (CHEM 2211, CHEM 2212) or consent of instructor.
   Graduate: NONE
Proposed Prerequisite(s), if different:
   Undergraduate:
   Graduate:

1) Reason(s) for change(s):

Dropping the laboratory component to consolidate the laboratory sequences as part of the new Biochemistry Cell and Molecular Biology Major

2) May this modified course replace the current course for students remaining in the old curriculum? Yes If not, please drop the current course and submit a new course form for the modification.
3) Do these modifications change any of the following? **For all Yes answers, please provide updated information on the next page.**

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Yes</th>
<th>No</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Content Areas</td>
<td>Yes</td>
<td>No</td>
<td>X</td>
</tr>
<tr>
<td>Projected Maximum Class Size (Cap)</td>
<td>Yes</td>
<td>No</td>
<td>X</td>
</tr>
</tbody>
</table>

4) Current Course fee(s) per student: **$15 per credit**
   for: Biology approved differential tuition fees.
   Proposed Course fee(s) per student, if different:
   for:

5) Service Areas:

   **None – all programs are within proposing departments so service notifications N/A**

This course is a requirement or an elective in the programs/areas listed below. To locate where this course appears please search the online catalog, as follows:
   a) go to [http://www.bemidjistate.edu/academics/catalog/](http://www.bemidjistate.edu/academics/catalog/) and choose the most recent catalog(s),
   b) click on “Areas of Study, and Course Descriptions,”
   c) click on “PDF of Entire Catalog” in upper right,
   d) press Ctrl F, and enter the prefix and number of the course(s) from this form.

   Non-licensure programs:
   * Biology, B.A. major
   * Biology, B.S. major Cellular and Molecular emphasis
   * Biology, B.S. major
   * Biology, B.S. major Medical Sciences emphasis
   * Biology minor
   * Chemistry, B.S. major Biochemistry/Biotechnology emphasis

   Teacher Licensure programs:

   Liberal Education:

   The above “service area” programs/departments were notified of this modification on __________ (date) by ____________ (mail, email, or phone).

   Please check one of the items below:
   ______ No comments were received from other programs or departments within one week of the notification.
   ______ Comments were received within one week of the notification, and are attached.
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
Undergraduate: BIOL 4360
Graduate: BIOL 5360

Proposed Course Number(s), if different:
Undergraduate: 
Graduate:

Current Course Title: Developmental and Tumor Biology
Proposed Course Title, if different:

Current Course Description:
Investigation of the mechanisms leading to the development of multicellular animal organisms from a fertilized egg. In contrast, the course also investigates how cells within a multicellular organism can become misregulated, leading to cancer. Lecture and lab. Prerequisites: BIOL 1211 and BIOL 1212. BIOL 2360 or BIOL 3380 is highly recommended. Might not be offered every year.

Proposed Course Description, if different:
Investigation of the mechanisms leading to the development of multicellular animal organisms from a fertilized egg. In contrast, the course also investigates how cells within a multicellular organism can become misregulated, leading to cancer. Prerequisites: BIOL 1211, BIOL 2360.

Current Credits: 4 credits
Proposed Credits, if different: 3 credits

Current Prerequisite(s):
Undergraduate: BIOL 1211 and BIOL 1212. BIOL 2360 or BIOL 3380 is highly recommended
Graduate: NONE
Proposed Prerequisite(s), if different:
Undergraduate: BIOL 1211, BIOL 2360.
Graduate:

1) Reason(s) for change(s):
Dropping the laboratory component to consolidate the laboratory sequences as part of the new Biochemistry Cell and Molecular Biology Major

2) May this modified course replace the current course for students remaining in the old curriculum? Yes ___ X ____ No _____ If not, please drop the current course and submit a new course form for the modification.
3) Do these modifications change any of the following? **For all Yes answers, please provide updated information on the next page.**

<table>
<thead>
<tr>
<th>Modification</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Learning Outcomes</td>
<td>Yes</td>
<td>No X</td>
</tr>
<tr>
<td>Major Content Areas</td>
<td>Yes</td>
<td>No X</td>
</tr>
<tr>
<td>Projected Maximum Class Size (Cap)</td>
<td>Yes</td>
<td>No X</td>
</tr>
</tbody>
</table>

4) Current Course fee(s) per student: $15

for: **Biology approved differential tuition fees**

Proposed Course fee(s) per student, if different: $

5) Service Areas:

**None – N/A all programs are within the proposing departments**

This course is a requirement or an elective in the programs/areas listed below. To locate where this course appears please search the online catalog, as follows:

a) go to [http://www.bemidjistate.edu/academics/catalog/](http://www.bemidjistate.edu/academics/catalog/) and choose the most recent catalog(s),
b) click on “Areas of Study, and Course Descriptions,”
c) click on “PDF of Entire Catalog” in upper right,
d) press Ctrl F, and enter the prefix and number of the course(s) from this form.

Non-licensure programs:

* Biology, B.A. major
* Biology, B.S. major Cellular and Molecular emphasis
* Biology, B.S. major
* Biology, B.S. major Medical Sciences emphasis

Teacher Licensure programs:

Liberal Education:

The above “service area” programs/departments were notified of this modification on ________ (date) by ___________________ (mail, email, or phone).

Please check one of the items below:

_____ No comments were received from other programs or departments within one week of the notification.

_____ Comments were received within one week of the notification, and are attached.
BSU Curriculum Forms

Form 3
Updated: 9.19.15

New Course Form

Course Number:
   Undergraduate: BCMB 1000
   Graduate: 

Course Title:
Biochemistry, Cell and Molecular Biology Careers (BCMB Careers)

Course Description:
An introduction to biochemistry, cell and molecular biology careers and curriculum planning for BCMB majors or students considering pursuing a BCMB degree.

Credits: 1

Prerequisite(s):
   Undergraduate: None
   Graduate: 

1. Reason(s) for creating this course:
   This course supports the new BCMB Major and will assist students in learning about career options and designing an academic program to complete their degree to support their career goal.

2. How often will this course be offered?
   Spring Semester Annually

3. What are the student learning outcomes for the course (please precede each outcome with "Students will...")?

   Students will:
   • learn the range of career options available to in the biochemistry and biotechnology fields including research, medicine, and healthcare careers.
   • identify a series of potential career options and draft multiple potential career plans.
   • finalize a career plan with options A and B.
   • create an educational plan for an undergraduate degree to support those career options.

4. What are the major content areas for the course?
   An overview of career options in the area of biochemistry, cell biology, molecular biology and the bioscience industry. A review of the BCMB major. See attached schedule for course topics.

5. Is this course repeatable for credit, and if so, what is the maximum number of credits that can be earned?
   No
6. If this course is intended primarily for off-campus delivery (not offered on campus), what delivery mechanism will be used?
No, on campus / in person delivery

7. What is the projected maximum class size (cap)?
24

8. What qualified faculty will be available to teach this course?
Drs. Katie Peterson, Ken Traxler, Holly LaFerriere, Michael Hamann, Mark Wallert

NOTE WELL: Department and dean, in approving this proposal, attest both to the adequacy of the qualifications of faculty here named, and to their availability to teach the course at the frequency specified above, without excessive overload or disruption to other curriculum.

9. What additional library and other resources need or should be provided for this course, that are not already available?
None. The resources are all available online.

10. What special personal property or service fee(s) would be charged to students taking this course? These charges would be for 1) items that are retained by the student and have an educational or personal value beyond the classroom, or 2) services that are on the student’s behalf (see MnSCU Board Policy 5.11).
Amount per student: $
For:
None

11. Attach a sample syllabus for the course. Note: if this course is double-numbered (u-grad/grad), the syllabus must include an additional component for graduate students.
| BCMB 1000: Biochemistry, Cell and Molecular Biology Careers  
(BCMB Careers) (1 credit) |
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Description:</strong></td>
</tr>
<tr>
<td>An introduction to biochemistry, cell and molecular biology careers and curriculum planning for BCMB majors or students considering pursuing a BCMB degree.</td>
</tr>
<tr>
<td><strong>Professor:</strong></td>
</tr>
<tr>
<td><strong>Office:</strong></td>
</tr>
<tr>
<td><strong>Office Hours:</strong></td>
</tr>
<tr>
<td><strong>Learning Objectives:</strong></td>
</tr>
<tr>
<td><strong>Students will:</strong></td>
</tr>
<tr>
<td>- learn the range of career options available in the biochemistry and biotechnology fields including research, medicine, and healthcare careers.</td>
</tr>
<tr>
<td>- identify a series of potential career options and draft multiple potential career plans.</td>
</tr>
<tr>
<td>- finalize a career plan with options A and B.</td>
</tr>
<tr>
<td>- create an educational plan for an undergraduate degree to support those career options.</td>
</tr>
<tr>
<td><strong>Assignments:</strong></td>
</tr>
<tr>
<td>- There will be weekly short writing assignments.</td>
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<td></td>
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<tr>
<td></td>
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<tr>
<td>- Final Presentation</td>
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<td></td>
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<tr>
<td><strong>Attendance:</strong></td>
</tr>
<tr>
<td>- Weekly attendance is required.</td>
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<td></td>
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<tr>
<td>- Having more than 2 unexcused absences will result in a reduction a student’s final grade by one letter grade.</td>
</tr>
<tr>
<td>- Having more than 4 unexcused absences will result in the student failing the course.</td>
</tr>
<tr>
<td><strong>Course Grades:</strong></td>
</tr>
<tr>
<td>Final grades for the course will be calculated based upon a total of 250 points</td>
</tr>
<tr>
<td>- 100 points from ten assignments at 10 points each.</td>
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<tr>
<td>- 30 points from two 15 points assignments</td>
</tr>
<tr>
<td>- 50 points from final presentation</td>
</tr>
<tr>
<td>- 70 points from attendance</td>
</tr>
<tr>
<td>Grades will be based on a 90%, 80%, 70%, 60% system.</td>
</tr>
</tbody>
</table>
Disability Services:
Upon request students with a documented disability may receive appropriate and reasonable
accommodations in this course including information in an alternate format. Please contact the
Disability Services Office at 755-3883 or email disabilityservices@bemidjistate.edu.

BCMB 1000: Biochemistry, Cell and Molecular Biology Careers (BCMB Careers)

<table>
<thead>
<tr>
<th>Class</th>
<th>Topic</th>
<th>Assignments</th>
<th>Reading Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course Introduction Student Introductions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Biochemistry and Biotechnology Across the Educational Spectrum</td>
<td>Assignment 1: Strengths and Passions 10 Points</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Healing, Fueling, Feeding</td>
<td>Assignment 2: What are your interests? 10 Points</td>
<td>Healing, Fueling, Feeding: How Biotechnology is Enriching Your Life</td>
</tr>
<tr>
<td>4</td>
<td>Bioscience Industry Sectors</td>
<td>Assignment 3: Industry Careers that Interests Me 10 Points</td>
<td>Chapter 1: Bioscience Industry Sectors</td>
</tr>
<tr>
<td>7</td>
<td>Bachelor’s Degree The Training Spectrum</td>
<td>Assignment 6: How am I Enhancing Competitiveness? 10 Points</td>
<td>The BCMB Major and Emphases</td>
</tr>
<tr>
<td>8</td>
<td>Bachelor’s Degree Research and Non-Technical Skills</td>
<td>Assignment 7: Detail Outline of Plan A and Plan B 10 Points</td>
<td></td>
</tr>
<tr>
<td>Class</td>
<td>Topic</td>
<td>Assignments</td>
<td>Reading Assignments</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>9</td>
<td>Graduate Degrees: MS, PSM, and Ph.D.</td>
<td>Assignment 8: Detail Outline of Plan C and Plan D</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Graduate Degrees: Biomedical Programs</td>
<td>Assignment 9: Are My Interests Changing?</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Graduate Degrees: Plants, Animals, and Energy</td>
<td>Assignment 10: My Undergraduate Education Plan Major / Minor / Value Added Draft 1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Health Professions: Medical School</td>
<td>Assignment 11: Final Version My Career Plans A and B</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Health Professions: Pharm.D. or Pharmacology</td>
<td>Assignment 12: My Undergraduate Education Plan Major / Minor / Value Added Final Version</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Final Exam Period</td>
<td>Assignment 13: Student Presentations My Education Plan and My Career Plans A and B</td>
<td></td>
</tr>
</tbody>
</table>

10 Points

11 Points

12 Points

13 Points

50 Points
New Course Form

Course Number:
Undergraduate: BCMB 3000
Graduate:

Course Title:
Biochemistry, Cell and Molecular Biology Research (BCMB Research)

Course Description:
An introduction to biochemistry, cell and molecular biology research available at BSU and professionally. Covers the basics of research and medical ethics. Identifying a research mentor for senior research projects and preparing a preliminary research proposal. Prerequisite(s): BCMB 1000.

Credits: 1

Prerequisite(s):
Undergraduate: BCMB 1000
Graduate:

1. Reason(s) for creating this course:
This course supports the new BCMB Major and will assist students in learning about research options and designing a research project for their senior research. A required course for the new BCMB major.

2. How often will this course be offered?
Spring Semester, Annually

3. What are the student learning outcomes for the course (please precede each outcome with "Students will...")?

Students will:
- learn the range of research opportunities available for BCMB majors on campus and professionally.
- understand the basic principles of science and medical research ethics.
- read and evaluate scientific literature.
- identify a research mentor for senior research.
- develop a preliminary research plan for senior research.

4. What are the major content areas for the course?
Biochemistry, Cell, and Molecular Biology Research. Research and medical ethics.
5. Is this course repeatable for credit, and if so, what is the maximum number of credits that can be earned?
No

6. If this course is intended primarily for off-campus delivery (not offered on campus), what delivery mechanism will be used?
No, on campus / in person delivery

7. What is the projected maximum class size (cap)?
24

8. What qualified faculty will be available to teach this course?
Drs. Katie Peterson, Ken Traxler, Holly LaFerriere, Michael Hamann, Mark Wallert

NOTE WELL: Department and dean, in approving this proposal, attest both to the adequacy of the qualifications of faculty here named, and to their availability to teach the course at the frequency specified above, without excessive overload or disruption to other curriculum.

9. What additional library and other resources need or should be provided for this course, that are not already available?
None. The resources are all available online.

10. What special personal property or service fee(s) would be charged to students taking this course? These charges would be for 1) items that are retained by the student and have an educational or personal value beyond the classroom, or 2) services that are on the student’s behalf (see MnSCU Board Policy 5.11).
Amount per student: $
For:
None

11. Attach a sample syllabus for the course. Note: if this course is double-numbered (u-grad/grad), the syllabus must include an additional component for graduate students.
### BCMB 3000: Biochemistry, Cell and Molecular Biology Research  
(BCMB Research) (1 credit)

<table>
<thead>
<tr>
<th>Course Description:</th>
<th>Professor:</th>
</tr>
</thead>
<tbody>
<tr>
<td>An introduction to biochemistry, cell and molecular biology research available at BSU and professionally. Covers the basics of research and medical ethics. Identifying a research mentor for senior research projects and preparing a preliminary research proposal. Prerequisite: BCMB 1000</td>
<td>Office:</td>
</tr>
<tr>
<td></td>
<td>Office Hours:</td>
</tr>
</tbody>
</table>

### Learning Objectives:
- To learn the range of research opportunities available for BCMB majors on campus and professionally.
- To understand the basic principles of science and medical research ethics.
- To read and evaluate scientific literature.
- To identify a research mentor for senior research.
- To develop a preliminary research plan for senior research.

### Assignments:
- Reading questions related to research and medical ethics.
- Journal article reading assignments
- Write an short research proposal

### Attendance:
- Weekly attendance is required.
  - We have 14 class session scheduled
  - 5 attendance points for each session for a total of 70 points.
- Having more than 2 unexcused absences will result in a reduction a student’s final grade by one letter grade.
- Having more than 4 unexcused absences will result in the student failing the course.

### Course Grades:
Grades will be based on a 90%, 80%, 70%, 60% system.

### Disability Services:
Upon request students with a documented disability may receive appropriate and reasonable accommodations in this course including information in an alternate format. Please contact the Disability Services Office at 755-3883 or email disabilityservices@bemidjistate.edu.
<table>
<thead>
<tr>
<th>Class</th>
<th>Topic</th>
<th>Reading / Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course Introduction</td>
<td>Student Introductions</td>
</tr>
<tr>
<td>2</td>
<td>Ethical Conduct of Research</td>
<td>The Ethics of Science: An Introduction</td>
</tr>
<tr>
<td>3</td>
<td>Ethical Conduct of Research with Animals and Humans</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Misconduct in Scientific Research</td>
<td>Ethics in Science: Ethical Misconduct in Scientific Research</td>
</tr>
<tr>
<td>5</td>
<td>Case Study – Misconduct in Scientific Research</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>BSU BCMB Research: Holly LaFerriere</td>
<td>Journal Article</td>
</tr>
<tr>
<td>7</td>
<td>BSU BCMB Research: Katie Peterson</td>
<td>Journal Article</td>
</tr>
<tr>
<td>8</td>
<td>BSU BCMB Research: Mike Hamann</td>
<td>Journal Article</td>
</tr>
<tr>
<td>9</td>
<td>BSU BCMB Research: Ken Traxler</td>
<td>Journal Article</td>
</tr>
<tr>
<td>10</td>
<td>BSU BCMB Research: Mark Wallert</td>
<td>Journal Article</td>
</tr>
<tr>
<td>11</td>
<td>Summer Research Programs</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Project Planning for Senior Research</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Project Planning for Senior Research</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Project Presentations</td>
<td></td>
</tr>
</tbody>
</table>
New Course Form

Course Number:
Undergraduate: BCMB 3074/ BIOL 3074 (dual / cross listed course)
Graduate:

*This course will be part of the Biology Department Cellular and Molecular emphasis, Medical Science Emphasis and Medical Laboratory Science program and will need the dual listing for these programs.

Course Title: Molecular Techniques

Course Description: This is a hybrid lecture and lab-based course and is an introduction to several common molecular-based techniques. Students will learn basic pipetting, protein assays, electrophoresis, PCR, and other molecular genetic techniques. Prerequisite(s): BIOL 1211, BIOL 2360, CHEM 2211, CHEM 2212; or consent of instructor.

Credits: 2

Prerequisite(s):
Undergraduate: BIOL 1211, BIOL 2360, CHEM 2211 and 2212; or consent of instructor.
Graduate:

1. Reason(s) for creating this course: This course will be the first one in a required core of lab courses for a new Biochemistry, Cellular and Molecular Biology (BCMB) major. The lab portion of the course will introduce students to common lab techniques that are required for proficient career-professions in the biomolecular fields.

2. How often will this course be offered? Once per year in the spring semester.

3. What are the student learning outcomes for the course (please precede each outcome with "Students will...")?

Students will:
- Become proficient in basic lab equipment handling and manipulation.
- Solve basic lab math related to concentrations and solution preparation.
- Understand the strengths and weaknesses of standard curves.
- Implement effective lab notebook practices.
- Demonstrate an understanding of basic lab techniques, including protein and nucleic acid measurements, electrophoresis techniques and principles, polymerase chain reactions, etc.
- Recognize common sources of error related to specific assays.
- Gain a practical understanding on how the Central Dogma of Molecular Biology is embedded into molecular biology experiments.
4. What are the major content areas for the course? The course is an exploration into basic lab techniques that are requisite to more advanced study and research in the BCMB program. As a foundational course, the basic lab techniques represent an essential skill set that will familiarize students with concepts related to analytical measurements, basic spectroscopy, macromolecular electrophoresis techniques, and specialized techniques in nucleic acid manipulation.

5. Is this course repeatable for credit, and if so, what is the maximum number of credits that can be earned? **Non-repeatable**

6. If this course is intended primarily for off-campus delivery (not offered on campus), what delivery mechanism will be used? **On-Campus**

7. What is the projected maximum class size (cap)? 24

8. What qualified faculty will be available to teach this course?
   - Biology: Drs. Hamann, LaFerriere, and Wallert
   - Chemistry: Drs. Peterson and Traxler

   NOTE WELL: Department and dean, in approving this proposal, attest both to the adequacy of the qualifications of faculty here named, and to their availability to teach the course at the frequency specified above, without excessive overload or disruption to other curriculum.

9. What additional library and other resources need or should be provided for this course, that are not already available? **Lab resources are currently available.**

10. What special personal property or service fee(s) would be charged to students taking this course? These charges would be for 1) items that are retained by the student and have an educational or personal value beyond the classroom, or 2) services that are on the student’s behalf (see MnSCU Board Policy 5.11).
   - Amount per student: $5 **This course will be dual listed as part of the biology program. The biology department has a differential tuition of $15/per credit.**
   - For: Lab-related materials

11. Attach a sample syllabus for the course. Note: if this course is double-numbered (u-grad/grad), the syllabus must include an additional component for graduate students.
BIOL 3074/BCMB 3074: Molecular Techniques  2 credits
Sattgast 237  T, R
Lecture=50 minutes per meeting
Lab= 1 hour per meeting

Dr. ______________, Sattgast:  Phone: 755-2798
Office Hours:  
Email:  

Dr. ______________, Sattgast :  Phone: 755-2946
Office Hours:  
Email:  

Course Description: This is a hybrid lecture and lab-based course and is an introduction to several common molecular-based techniques. Students will learn basic pipetting, protein assays, electrophoresis, PCR, and other molecular genetic techniques.

Prerequisite(s): BIOL 1211, BIOL 2360, CHEM 2211, CHEM 2212; or consent of instructor.

Objectives: The ability to conduct research at the molecular level is highly dependent upon being skilled at a variety of laboratory techniques, methods, and assays. Expert utilization of these techniques is often required to successfully accept or reject a hypothesis proposed by a researcher. This course is meant to provide an opportunity for undergraduate students in the molecular-level sciences to gain skills in common methodologies related to molecular biology and biochemistry, with the goal of providing the necessary background to facilitate the student’s ability to successfully pursue an independent project during their senior capstone experiences. The techniques taught in the course are also useful to those pursuing professional degree programs that may require some basic knowledge regarding antibody based techniques, PCR, electrophoresis, and other common molecular biology techniques.

Student Learning Outcomes:

Students will:
1. Become proficient in basic lab equipment handling and manipulation.
2. Solve basic lab math related to concentrations and solution preparation.
3. Understand the strengths and weaknesses of standard curves.
4. Implement effective lab notebook practices.
5. Demonstrate an understanding of basic lab techniques, including protein and nucleic acid measurements, electrophoresis techniques and principles, polymerase chain reactions, etc.
6. Recognize common sources of error related to specific assays.
7. Gain a practical understanding on how the Central Dogma of Molecular Biology is embedded into molecular biology experiments.

Texts and Web materials:
There are no textbooks required, but some reading materials may be assigned. Necessary lab materials will be made available on-line through the D2L/Brightspace website. The D2L website address is: https://bemidjistate.mnsu.mnscu.edu/ In order to log-in, type your user name and password in the boxes provided. Scroll down to the bottom of the page to find what classes are available to you on D2L, and click on “Molecular Techniques”. Course materials will be available under the “content” tab.

Occasionally, announcements and study hints will be made through mass emails for the class. These emails will go to BSU email account. Check the BSU email account daily.

Time expectations:
Your attendance is essential. You are allowed one unexcused absence from a lab session. A second unexcused absence will result in dropping a letter grade. Three will result in a failing grade.

Although the experiments and procedures for the lab will be kept to the lab meeting times as much as possible, it is likely that some may require some time outside of the normal lab meeting times. Additionally, students should plan on 1-2 hours per week of additional outside reading, preparation, and time for writing lab reports.

Grading:
Graded items include:
1. Maintaining a lab notebook (35%). The lab notebook for the course must be bound notebook purchased by the student and maintained according to the directions provided on the first day of class. The lab notebook will be checked three times during the semester, once within two weeks of the course, midterm, and the last week of class.

2. Lab reports (35%) These will vary from lab assignment to lab assignment. Some labs may only take one week and will have a relatively short write-up of lower point value (labeled as rpt on the schedule), while multi week labs will be longer reports and account for a larger number of overall points (BIG rpt on schedule). More information will be provided regarding the layout and structure of lab reports.

3. Participation (10%): Labs require active participation in terms of attendance, inquisitiveness, collegiality, safety, and cleanliness. These points are awarded/deducted at the discretion of the professor.

4. Lecture quizzes (20%): Occasional, short quizzes will be based on techniques.

Percent of total points | Letter grade
---|---
100-90 | A
89-80 | B
79-70 | C
69-60 | D
below 59 | E

The labs will be grouped into two sections during the semester. The first part of the semester will be an introduction to a couple essential techniques, the second and largest part of the semester will be series of labs aimed at providing a sense of an actual project that could be carried out in a research lab. Write-ups will be required for the specific lab sections. Each write-up will be worth 10 points.

Your test scores available on the D2L website so that you can keep up to date on where you are at in terms of your grade. Please contact the course professors regarding any concerns you have about grades during the semester.

Note that additional, graded assignments could occur during the semester.

Policy Statements: Students are expected to practice the highest standards of ethics, honesty, and integrity in all of their academic work. Any form of academic dishonesty (e.g. plagiarism, cheating, and misrepresentation) will result in disciplinary action. Possible disciplinary actions may include failure for part or all of a course, as well as suspension from the university.

Disability Services: Upon request students with a documented disability may receive appropriate and reasonable accommodations in this course including information in an alternate format. Please contact the Disability Services Office at 755-3883 or email disabilityservices@bemidjistate.edu.
Tentative Schedule:
The lecture/labs will divided into two sections during the semester. The first part of the semester will be an introduction to essential protein based techniques, and the second part will be an introduction to DNA techniques.

<table>
<thead>
<tr>
<th>Week</th>
<th>Tues</th>
<th>Thurs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lab safety, Notebook overview</td>
<td>Micropipetting (rpt)</td>
</tr>
<tr>
<td>2</td>
<td>Buffer prep, pH meter (rpt)</td>
<td>UV Protein and nucl. acid msrmt</td>
</tr>
<tr>
<td>3</td>
<td>colorimetric assays (rpt, NB check #1)</td>
<td>electrophoresis principles</td>
</tr>
<tr>
<td>4</td>
<td>immune-based assays I (immunif)</td>
<td>immune based assays II (I, rpt)</td>
</tr>
<tr>
<td>5</td>
<td>immune-based assays III (ELISA)</td>
<td>immune-based assays III (ELISA II, rpt)</td>
</tr>
<tr>
<td>6</td>
<td>protein purification I</td>
<td>protein purification II</td>
</tr>
<tr>
<td>7</td>
<td>SDSPAGE</td>
<td>Densitometry</td>
</tr>
<tr>
<td>8</td>
<td>enzyme assay</td>
<td>assay continued (BIG RPT, NB check #2)</td>
</tr>
<tr>
<td>9</td>
<td>Molecular DNA lecture</td>
<td>APE program, bioinformatics</td>
</tr>
<tr>
<td>10</td>
<td>miniprep, RE digestion</td>
<td>Agarose gel (rpt)</td>
</tr>
<tr>
<td>11</td>
<td>PCR lab</td>
<td>PCR lab continued (rpt)</td>
</tr>
<tr>
<td>12</td>
<td>ligation</td>
<td>transformation</td>
</tr>
<tr>
<td>13</td>
<td>miniprep screening (rpt)</td>
<td>miniprep screening</td>
</tr>
<tr>
<td>14</td>
<td>cDNA prep</td>
<td>cDNA prep continued</td>
</tr>
<tr>
<td>15</td>
<td>rtPCR</td>
<td>rtPCR analysis (BIG rpt, NB check #3)</td>
</tr>
</tbody>
</table>
New Course Form

Course Number:
- Undergraduate: BCMB 3075 / BIOL 3075
- Graduate:

*This course will be part of the Biology Department Cellular and Molecular emphasis, Medical Science Emphasis and Medical Laboratory Science program and will need the dual listing for these programs.

Course Title: Cellular Techniques

Course Description:
This course is the one of two options for completion of techniques core requirement for the BCMB major and for specific Biology majors. Includes an introduction to cell culture, cell imaging, cell-based assays, and stem cell biology. Prerequisite(s): BIOL 3074 or BCMB 3074.

Credits: 2

Prerequisite(s):
- Undergraduate: BIOL 3074 or BCMB 3074
- Graduate:

1. Reason(s) for creating this course:
This course supports the new BCMB Major and will teach students basic skills in cell culture, cell-based assays, cell imaging and stem cell biology commonly used in BCMB research and careers. A restricted elective for the new BCMB major.

2. How often will this course be offered?
Fall Semester Annually

3. What are the student learning outcomes for the course (please precede each outcome with "Students will...")?

Student will:
- learn basic techniques in cell culture.
- learn the basics of epifluorescence and confocal imaging.
- learn cell-based assays related to cell proliferation, migration, stress fiber formation.
- learn the basic techniques involved in stem cell research and regulated induction of differentiation.
4. What are the major content areas for the course?

Cell Biology, Cell Culture, Cell-based Assays, Stem Cell Biology

5. Is this course repeatable for credit, and if so, what is the maximum number of credits that can be earned?

Not Repeatable

6. If this course is intended primarily for off-campus delivery (not offered on campus), what delivery mechanism will be used?

No. On campus only.

7. What is the projected maximum class size (cap)?

24

8. What qualified faculty will be available to teach this course?

Biology: Drs. Hamann, LaFerriere, and Wallert
Chemistry: Drs. Peterson and Traxler

NOTE WELL: Department and dean, in approving this proposal, attest both to the adequacy of the qualifications of faculty here named, and to their availability to teach the course at the frequency specified above, without excessive overload or disruption to other curriculum.

9. What additional library and other resources need or should be provided for this course, that are not already available?

No

10. What special personal property or service fee(s) would be charged to students taking this course? These charges would be for 1) items that are retained by the student and have an educational or personal value beyond the classroom, or 2) services that are on the student’s behalf (see MnSCU Board Policy 5.11).

Amount per student: $ This course will be dual listed as part of the biology program. The biology department has a differential tuition of $15 per credit.

for: Lab-related materials

11. Attach a sample syllabus for the course. Note: if this course is double-numbered (u-grad/grad), the syllabus must include an additional component for graduate students.
# BCMB / BIOL 3075: Cellular Techniques  (2 credits)

## Syllabus

### Fall 2018

<table>
<thead>
<tr>
<th>Class Time:</th>
<th>Successful completion of this course will require a substantial out of class commitment.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuesday and Thursday</td>
<td></td>
</tr>
<tr>
<td>3:00 – 4:50 p.m.</td>
<td></td>
</tr>
<tr>
<td>Location:</td>
<td>Sattgast 233 / 237 / 244</td>
</tr>
</tbody>
</table>

### Professor:

Dr. Mark Wallert  
Associate Professor of Biology

<table>
<thead>
<tr>
<th>Office:</th>
<th>Sattgast 218H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab:</td>
<td>Sattgast 233</td>
</tr>
<tr>
<td>Phone:</td>
<td>755-2925</td>
</tr>
<tr>
<td>E-mail:</td>
<td><a href="mailto:mwallert@bemidjistate.edu">mwallert@bemidjistate.edu</a></td>
</tr>
</tbody>
</table>

### Office Hours:

Meeting times available by appointment

### Course Description:

This course is the one of two options for completion of techniques core requirement for the BCMB major and for specific Biology majors. Includes an introduction to cell culture, cell imaging, cell-based assays, and stem cell biology. Prerequisite(s): BIOL 3074 or BCMB 3074.

### Student Learning Outcomes:

- Learn basic techniques in cell culture.
- Learn the basics of epifluorescence and confocal imaging.
- Learn cell-based assays related to cell proliferation, migration, stress fiber formation.
- Learn the basic techniques involved in stem cell research and regulated induction of differentiation.

### Course materials available D2L Brightspace:

- Syllabus  
- Journal Articles  
- Laboratory Protocols  
- Laboratory Support Materials  
- Assignments  
- Notebook Instructions

### Attendance:

- Class attendance is considered mandatory.
- Successful completion of research projects will require work both during and outside of class time.
- Having 3 unexcused absences for class will result in failure of the course.
**Class Participation:**
- Class start exactly at 3:00 p.m. on Tuesday and Thursday.
- **You will lose 5 points for every time you are late for class without prior approval.**
- You are expected to participate equally in your group’s work both in class and out of class. You need to keep notes in your laboratory notebook every time you are doing work in the laboratory.
- Each group must maintain a culture log of all cell culture work done whether during class time or out of class time. You **MUST** cross reference your entries in the culture log with you laboratory notebook.
- If you are scheduled to care for cells outside of class time and cannot make it, you must contact a member of your research group to cover for you. 
  *If no one can cover your absence, you will lose 5 points for missing an assigned activity.*

**Laboratory Notebooks:**
- Laboratory notebooks are an essential aspect of any research endeavor. Notebooks will collected and checked on different occasions this semester without prior warning. Each notebook check is worth 25 points.
- Notebooks should be maintained while you are doing your work, not completed outside of the laboratory. **Anybody working in the laboratory without having a notebook present will be docked 5 Notebook points.**
- Notebooks turned in late will have **5 points deducted for every day they are late**. Notebooks turned in after laboratory time on the day requested will be considered 1 late. Notebooks turned in more than 24 hours after the end of laboratory on the day requested are considered 2 days late.

**Journal Article Evaluation:**
- We will read and evaluate one journal article as a group that is related to our research.
- Each student will then be assigned one journal article related to their project.
  - Students will be required to write a short summary of the article.
  - Students will prepare a PowerPoint Presentation related to that journal article.

**Course Grades:** Final grades for the course will be calculated based upon a total of 300 points
- 100 points for Laboratory Notebooks
- 100 points for Class Participation
- 50 points for Journal Article Evaluation
- 50 points for PowerPoint Presentation

**Disability Services:**
Upon request students with a documented disability may receive appropriate and reasonable accommodations in this course including information in an alternate format. Please contact the Disability Services Office at 755-3883 or email disabilityservices@bemidjistate.edu.

**Mental Health:**
You may experience mental health concerns or stressful events that may lead to diminished academic performance. The Student Center for Health & Counseling is available to assist you with concerns.

Cedar Hall 1st Floor
755-2053
Academic Integrity:
BSU students are expected to practice the highest standards of ethics, honesty and integrity in all of their academic work. Any form of academic dishonesty (e.g., plagiarism, cheating and misrepresentation) may result in disciplinary action. Possible disciplinary actions may include failure for part of all of a course as well as suspension from the University.

BCMB 3075 Cellular Techniques Schedule

<table>
<thead>
<tr>
<th>Class</th>
<th>Topic</th>
<th>Reading / Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course Introduction</td>
<td>Introduction to Cell Culture</td>
</tr>
<tr>
<td>2</td>
<td>Cell Culture Practice</td>
<td>Cell Counting Introduction to Cell Proliferation</td>
</tr>
<tr>
<td>3</td>
<td>Evaluation of Cell Proliferation</td>
<td>• Growth Curves • Proliferation Assays</td>
</tr>
<tr>
<td>4</td>
<td>Introduction to Stress Fiber Biology and Assays</td>
<td>Introduction to Fluorescence Microscopy • Epifluorescence • Confocal</td>
</tr>
<tr>
<td>5</td>
<td>Stress Fiber Assay</td>
<td>Stress Fiber Imaging</td>
</tr>
<tr>
<td>6</td>
<td>Introduction to Fluorescence Microscopy</td>
<td>• Confocal</td>
</tr>
<tr>
<td>7</td>
<td>Introduction to Organelle Staining and Identification</td>
<td>• Organelle Imaging • Multicolor Imaging • 3 Dimensional Reconstruction of Confocal Images</td>
</tr>
<tr>
<td>8</td>
<td>Introduction to Cell Migration and Invasion</td>
<td>• Wounding Assays • ECIS Assay • Transwell Assays</td>
</tr>
<tr>
<td>9</td>
<td>Cell Migration and Invasion</td>
<td>• Wounding Assays • ECIS Assay • Transwell Assays</td>
</tr>
<tr>
<td>10</td>
<td>Introduction to Stem Cell Biology</td>
<td>Adult Stem Cells</td>
</tr>
<tr>
<td>11</td>
<td>Maintaining Stem Cells in Culture</td>
<td>• Adipose Derived Adult Stem Cells</td>
</tr>
<tr>
<td>12</td>
<td>Stem Cell Imaging</td>
<td>• Stem Cell Markers</td>
</tr>
<tr>
<td>13</td>
<td>Regulated Stem cell Differentiation</td>
<td>• Adipose, Cartilage, Bone</td>
</tr>
<tr>
<td>14</td>
<td>Differentiated Cell Imaging</td>
<td></td>
</tr>
</tbody>
</table>
BSU Curriculum Forms

Form 3
Updated: 9.19.15

New Course Form

Course Number:
  Undergraduate: BCMB 3076/ CHEM 3076
  Graduate:

*This course will be part of the Chemistry Department Biochemistry emphasis and will need the dual listing for this program.

Course Title: Biochemical Techniques

Course Description:
This course is one of two options for completion of the techniques core requirement for the BCMB major. Includes some basic biochemical techniques, but introduces more advanced biochemical laboratory experiments. Prerequisite(s): CHEM 4471 or BCMB 3074 or BIOL 3074.

Credits: 2

Prerequisite(s):
  Undergraduate: CHEM 4471 or BCMB 3074 or BIOL 3074.
  Graduate:

1. Reason(s) for creating this course:
This course supports the new BCMB Major and will assist students in learning basic and advanced biochemical experimentation and instrumentation. These skills and techniques will be of value for individuals pursuing a research career or an advanced degree.

2. How often will this course be offered? Spring Semester Annually

3. What are the student learning outcomes for the course (please precede each outcome with "Students will...")?
Students will:
- learn or review the basics of enzyme kinetics.
- perform an enzyme kinetics assay using spectrophotometric methods.
- perform an enzyme kinetics assay using chromatographic methods.
- learn or review the basics of protein-ligand binding.
- perform an analysis of ligand binding using spectrophotometric methods.
- learn or review electrophoresis of proteins.
- perform protein analysis via two-dimensional electrophoresis.
- learn or review emission spectroscopy.
- perform an experiment utilizing fluorescence resonance energy transfer.
- learn or review nuclear magnetic resonance.
- perform a one-dimensional NMR analysis of a macromolecule.
4. What are the major content areas for the course?

**More advanced laboratory concepts of biochemistry and biotechnology.**

5. Is this course repeatable for credit, and if so, what is the maximum number of credits that can be earned?

No

6. If this course is intended primarily for off-campus delivery (not offered on campus), what delivery mechanism will be used?

No, on campus / in person delivery

7. What is the projected maximum class size (cap)?

24

8. What qualified faculty will be available to teach this course?

**Drs. Katie Peterson, Ken Traxler, Holly LaFerriere, Michael Hamann, Mark Wallert**

NOTE WELL: Department and dean, in approving this proposal, attest both to the adequacy of the qualifications of faculty here named, and to their availability to teach the course at the frequency specified above, without excessive overload or disruption to other curriculum.

9. What additional library and other resources need or should be provided for this course, that are not already available?

No additional resources will be needed.

10. What special personal property or service fee(s) would be charged to students taking this course? These charges would be for 1) items that are retained by the student and have an educational or personal value beyond the classroom, or 2) services that are on the student’s behalf (see MnSCU Board Policy 5.11).

   Amount per student: **$15 per credit**

   For: Equivalent to the current laboratory fees for upper division chemistry courses. This course will be dual listed as part of the chemistry program.

11. Attach a sample syllabus for the course. Note: if this course is double-numbered (u-grad/grad), the syllabus must include an additional component for graduate students.
BCMB 3076 / CHEM 3076 BIOCHEMICAL TECHNIQUES
(2 credits)

Instructor: Kenneth W. Traxler, Ph.D.
Schedule: The lab will meet from 3 – 4:50 p.m. on Monday and Wednesday in Sattgast Hall 367.
Text: None required. Handouts will be provided.

Grading: 100 – 90% A
89 – 80% B
79 – 70% C
69 – 60% D
59 – 0% E

Prelabs: 20 points each
Lab Reports: 40 points each

Course Description: This course is one of two options for completion of the techniques core requirement for the BCMB major. Includes some basic biochemical techniques, but introduces more advanced biochemical laboratory experiments. Prerequisite(s): CHEM 4471 or BCMB 3074 or BIOL 3074.

Course Prospectus and Guidelines: The purpose of the Biochemical Techniques is to introduce you to a mixture of classical and modern biochemical methods. Many of the techniques you will perform have been discussed in the lectures of your biochemistry courses, but some may be new. The schedule for experiments is a framework and we will deviate from it if additional time is needed for some experiments. When prelabs are assigned, they will be due at the beginning of the laboratory period. No exceptions. Lab reports are due one week after the completion of the lab. Points will be deducted for late lab reports. You will not be required to turn your lab book in for grading, but you should have it with you in the lab for taking notes while performing your experiment.

Tentative Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Laboratory safety. Review of enzyme kinetics.</td>
</tr>
<tr>
<td>2</td>
<td>Experiment 1. Enzyme kinetics assay using spectrophotometric methods</td>
</tr>
<tr>
<td>3</td>
<td>Experiment 2. Enzyme assay continued (enzyme inhibitors).</td>
</tr>
<tr>
<td>4</td>
<td>Experiment 3. Enzyme kinetics assay using chromatographic methods.</td>
</tr>
<tr>
<td>5</td>
<td>Enzyme assay continued.</td>
</tr>
<tr>
<td>6</td>
<td>Review of chemical equilibria, ligand binding, Hill plots, Scatchard plots and competition studies.</td>
</tr>
<tr>
<td>7</td>
<td>Experiment 4. Receptor-ligand interaction assay.</td>
</tr>
<tr>
<td>8</td>
<td>Experiment 5. Receptor competition assay.</td>
</tr>
<tr>
<td>9</td>
<td>Review of electrophoresis.</td>
</tr>
<tr>
<td>10</td>
<td>Experiment 6. Two-dimensional protein electrophoresis.</td>
</tr>
<tr>
<td>11</td>
<td>Introduction/review of emission spectroscopy.</td>
</tr>
<tr>
<td>12</td>
<td>Experiment 7. Fluorescence resonance energy transfer experiment.</td>
</tr>
<tr>
<td>13</td>
<td>Introduction/review of nuclear magnetic resonance spectroscopy</td>
</tr>
<tr>
<td>14</td>
<td>Experiment 8. One-dimensional NMR of macromolecules.</td>
</tr>
</tbody>
</table>

Disability Services: Upon request students with a documented disability may receive appropriate and reasonable accommodations in this course including information in an alternate format. Please contact the Disability Services Office at 755-3883 or email disabilityservices@bemidjistate.edu.
BSU Curriculum Forms

Form 3
Updated: 9/19/15

New Course Form

Course Number:
Undergraduate: BIOL 4460
Graduate: BIOL 5460

Course Title: Stem Cells and Regenerative Medicine

Course Description: This course is designed as an introduction to stem cell biology and the medical applications of stem cells including in the field of regenerative medicine. Prerequisite(s): BIOL 2360.

Credits: 3

Prerequisite(s):
Undergraduate: BIOL 2360
Graduate: Degree in Biology, Biochemistry, Chemistry or related field

1. Reason(s) for creating this course:

To expand BSU’s offerings in the biomedical sciences and support the new Biochemistry Cell and Molecular Biology Major

2. How often will this course be offered? Annually

3. What are the student learning outcomes for the course (please precede each outcome with "Students will...")?

Students will be able to:
• explain the properties that define different stem cell populations.
• explain how stem cells are derived for scientific research and evaluate different applications.
• Formulate the rolls of tissue-specific stem cells and the mechanisms that regulate their functions.
• summarize common uses of stem cells and propose potential clinical use(s) of stem cells in regenerative medicine.

4. What are the major content areas for the course?

Stem Cell Biology, Cell Biology, Biochemistry, and Regenerative Medicine

5. Is this course repeatable for credit, and if so, what is the maximum number of credits that can be earned?
6. If this course is intended primarily for off-campus delivery (not offered on campus), what delivery mechanism will be used?

**The course is designed to be deliver on-line or on-campus.**

7. What is the projected maximum class size (cap)?

24

8. What qualified faculty will be available to teach this course?

**Dr. Mark Wallert**

NOTE WELL: Department and dean, in approving this proposal, attest both to the adequacy of the qualifications of faculty here named, and to their availability to teach the course at the frequency specified above, without excessive overload or disruption to other curriculum.

9. What additional library and other resources need or should be provided for this course, that are not already available?

**None**

10. What special personal property or service fee(s) would be charged to students taking this course? These charges would be for 1) items that are retained by the student and have an educational or personal value beyond the classroom, or 2) services that are on the student’s behalf (see MnSCU Board Policy 5.11).  
   Amount per student: $15/credit
   For: **Biology approved differential tuition fees.**

11. Attach a sample syllabus for the course. Note: if this course is double-numbered (u-grad/grad), the syllabus must include an additional component for graduate students.
Biology 4460 / 5460: Stems Cells and Regenerative Medicine

Dr. Mark Wallert

Spring Semester

On-Line Synchronous

Professor:
Dr. Mark Wallert
Associate Professor of Biology
Office: Sattgast 218H
Phone: 218-755-2925
E-mail: mwallert@bemidjistate.edu

Office Hours:
Meeting times available by appointment.
We can meet in person, by phone, or via skype.

Reading Materials and Other Resources

There is not a required textbook for this course. This course is new to Bemidji State University and new for me as an independent course. We will use a range of reading materials throughout this course which include scientific journal articles, available book chapters, popular media articles, web resources. These readings materials will be made available in D2L Brightspace, in the content area.

Course Description:

This course is designed at an introduction to stem cell biology and the medical applications of stem cells including in the field of regenerative medicine.

Prerequisites: Biology 2360 Genetics

Student Learning Outcomes:

- Students will be able to:
  - explain the properties that define different stem cell populations.
  - explain how stem cells are derived for scientific research and evaluate different applications.
  - Formulate the rolls of tissue-specific stem cells and the mechanisms that regulate their functions.
  - summarize common uses of stem cells and propose potential clinical use(s) of stem cells in regenerative medicine.
Course Organization and Commitment:

Stems Cells and Regenerative Medicine is a 3 credit combined undergraduate and graduate course.

The course will be run as an on-line, synchronous course which will follow a typical semester schedule. I will post or assign the equivalent of 3 lecture hour’s material each week with associated reading materials. These materials will include lectures that I record using a tool called Panopto as well as lectures available on the web from experts in the field, and reading materials. You should anticipate requiring the same time commitment for this course as any senior/graduate level course. This means 3 – 4 hours of lecture equivalent work each week along with 6 to 10 hours of reading and studying time.

Course materials available D2L Brightspace:

- Syllabus and Schedule
- Reading Materials
- Recorded Panopto Lectures
- PowerPoint Lectures in both PPT and PDF format
- Study Guides
- Quizzes
- Assignment and Exam Dropbox
- Announcements and Reminders
- Access to Discussion Functions
- Grades

Study Guides:

Available for each week’s lecture topics we will cover.

Includes:

- Learning Outcomes
- Terminology List
- Reading Requirements
- Any additional study materials that I feel will be helpful.
Quizzes:

A total of 6 quizzes will required for this course comprising 180 total points.

The quizzes are designed to evaluate basic knowledge of the topic materials covered in the lecture portion of the class.

Each quiz will have a defined open window which will run from 8 a.m. Thursday to 11:59 p.m. Sunday. The quizzes must be completed during that time window.

Quizzes will be 15 to 30 question and will be worth 30 points. Students have 30 minutes to complete the quizzes and due to the nature of the course, quizzes are considered open note and open book.

Quizzes are scheduled:
- Quiz 1: January 19 – 22
- Quiz 2: February 2 – 5
- Quiz 3: February 16 – 19
- Quiz 4: March 2 – 5
- Quiz 5: March 30 – April 2
- Quiz 6: April 13 - 16

Exams:

The course will include 3 regular exams, and a comprehensive final. Each regular exam is worth 100 points and the final is worth 200 points. Exams will account for 500 points towards your final grade.

These exams will be essay exams that will be word processed and turned in to the D2L Brightspace Assignment tool.

Exams will be available approximately 1 week prior to their due date.

Exams will be due on the following dates:
- Exam 1: Sunday February 12 at 11:59 p.m.
- Exam 2: Sunday March 12 at 11:59 p.m.
- Exam 3: Sunday April 23 at 11:59 p.m.
- Final Exam: Wednesday May 3 at 11:59 p.m.

There will be a 10 point deduction per each 24 hour period an exam is turned in late. This means that exams turned in at Midnight after the due date 11:59 p.m. that day will have 10 points deducted from the score. Ten additional points will be deducted for each 24 hour period the exam is late.
Class Participation:

Class participation in online course is always an interesting concept. I will be requiring participation through the use of the D2L Brightspace Discussion Board.

Discussion Board:

Each week I will post specific questions or comments related to the course materials we are covering. These topics may be directly course related or related to issues about stem cells and regenerative medicine in the new. For each discussion topic I initiate, each student will be required to make an appropriate response to that topic, plus comment on at least one other student’s comments. The goal is for each student to make a minimum of two primary responses and two secondary responses each week.

I will check the discussion board at least once each day between 7 and 9 a.m. and will post my discussion topics during that time.

Participation in the Discussion Board will account for 120 points towards your final grade.

- 4 posting each week
- 2 points per post
- 15 weeks for posts

Undergraduate Grades:

For the undergraduate students taking the course as Biology 4460 course grades will be calculated based upon a total of 800 points.

Point Breakdown:

- 500 points for Exams
- 180 points for Quizzes
- 120 points for Class Participation

Letter grades will be based on a 90%, 80%, 70%, 60% systems:

- A 720 points
- B 640 points
- C 560 points
- D 480 points
Graduate Requirements:

For the students taking the course as Biology 5460 there will be two additional assignments.

First, graduate students will need to write a paper that will account for 100 points towards your final grade. The topic for the paper should relate to a current issues in stem cells or regenerative medicine. Paper instructions are provided in the content area of D2L Brightspace. Paper topics will need to be approved.

Second, graduate students will direct the discussion board for one week related to their paper topic. Hosting this discussion will account for 50 points towards your final grade. The week for your discussion will be schedule in consultation with the instructor.

Graduate Paper Timeline:

- Topics Approved by January 27
  5 points
- Paper Outline Submitted February 24
  20 points
- First Draft Paper due March 24
  25 points
- Final Draft Paper due April 7
  50 points
- Graduate Student Discussion Board held weeks of April 17 and April 24
  50 points

Graduate Grades:

For the students taking the course as Biology 5460 course grades will be calculated based upon a total of 950 points.

Point Breakdown:

- 500 points for Exams
- 180 points for Quizzes
- 120 points for Class Participation
- 100 points for Paper
- 50 points for Hosting Discussion Board

Letter grades will be based on a 92%, 84%, 76%, 68% systems.

A  855 points
B  760 points
C  665 points
D  570 points
### Accommodations:

Upon request students with a documented disability may receive appropriate and reasonable accommodations in this course including information in an alternate format. Please contact the Disability Services Office at 755-3883 or email disabilityservices@bemidjistate.edu.

### Mental Health:

You may experience mental health concerns or stressful events that may lead to diminished academic performance. The Student Center for Health & Counseling is available to assist you with concerns.

Cedar Hall 1st Floor  
755-2053

### Academic Integrity:

BSU students are expected to practice the highest standards of ethics, honesty and integrity in all of their academic work. Any form of academic dishonesty (e.g., plagiarism, cheating and misrepresentation) may result in disciplinary action. Possible disciplinary actions may include failure for part of all of a course as well as suspension from the University.
BSU Curriculum Forms

Form 3
Updated: 9.19.15

New Course Form

Course Number:
Undergraduate: BIOL 4470
Graduate: BIOL 5470

Course Title: Introduction to Vaccinology

Course Description:
This course will introduce students to the field of vaccinology and aspects of the bioscience industry related to vaccine discovery, production, and testing. Students will learn about the history of vaccines; the production of vaccines in a regulated environment; the benefits and concerns with vaccine use. The course will include a discussion of vaccine types, delivery, efficacy, and safety. Students will learn about the mechanism of action of different vaccines; traditional verses modern vaccine production methods, the process of clinical trials and approval for new vaccines; and discuss ethical concerns related to vaccine use. Prerequisite(s): BIOL 2360.

Credits: 4

Prerequisite(s):
Undergraduate: BIOL 2360
Graduate: Degree in Biology, Biochemistry, Chemistry or related field

1. Reason(s) for creating this course:
To expand BSU’s offerings in the biomedical sciences and support the new Biochemistry Cell and Molecular Biology Major

2. How often will this course be offered? Annually

3. What are the student learning outcomes for the course (please precede each outcome with "Students will...")?

Students will:
- describe how various types of vaccines evoke an immune response and provide protective immunity.
- discuss a broad range of vaccine preventable diseases and apply the basic principles of vaccinology to disease prevention.
- summarize the overall principles and key steps of the pharmaceutical clinical development process, from bench to product and provide specific examples.
- explain appropriate techniques for administration of vaccines by intramuscular, subcutaneous, and intranasal routes as well as describe the possible immunological benefits of each method.
- discuss the ethical concerns regarding the vaccine debate and apply these concerns to debates regarding costs, benefits, and risks of vaccination.
• develop an in-depth, thorough understanding of vaccinology and vaccine-induced immunity.
• evaluate the mechanism of action of different vaccines.
• appraise traditional verses modern vaccine production methods.
• list the various regulatory steps for clinical trials and approval for new vaccines.

4. What are the major content areas for the course?
   Immunology, Biochemistry, Cell Biology, Vaccines
   See attached schedule for specific topics.

5. Is this course repeatable for credit, and if so, what is the maximum number of credits that can be earned?
   No

6. If this course is intended primarily for off-campus delivery (not offered on campus), what delivery mechanism will be used?
   The course is designed to be deliver on-line or on-campus.

7. What is the projected maximum class size (cap)?
   24

8. What qualified faculty will be available to teach this course?
   Dr. Mark Wallert

NOTE WELL:  Department and dean, in approving this proposal, attest both to the adequacy of the qualifications of faculty here named, and to their availability to teach the course at the frequency specified above, without excessive overload or disruption to other curriculum.

9. What additional library and other resources need or should be provided for this course, that are not already available?
   None

10. What special personal property or service fee(s) would be charged to students taking this course?
    These charges would be for 1) items that are retained by the student and have an educational or personal value beyond the classroom, or 2) services that are on the student’s behalf (see MnSCU Board Policy 5.11).
    Amount per student: $15 / credit
    For: Biology approved differential tuition fees.

11. Attach a sample syllabus for the course. Note: if this course is double-numbered (u-grad/grad), the syllabus must include an additional component for graduate students.
**Biology 4470 / 5470: Introduction to Vaccinology**

**Dr. Mark Wallert**

<table>
<thead>
<tr>
<th><strong>Professor:</strong></th>
<th><strong>Office Hours:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Mark Wallert Associate Professor of Biology</td>
<td>Meeting times available by appointment. We can meet in person, by phone, or via skype.</td>
</tr>
<tr>
<td>Office: Satgast 218H</td>
<td></td>
</tr>
<tr>
<td>Phone: 218-755-2925</td>
<td></td>
</tr>
<tr>
<td>E-mail: <a href="mailto:mwallert@bemidjistate.edu">mwallert@bemidjistate.edu</a></td>
<td></td>
</tr>
</tbody>
</table>

**Required Books:** There will be three required resources that you will need to obtain for the course. The Pink Book from the CDC can be purchased from the CDC, but they also have it available as a free PDF download at [http://www.cdc.gov/vaccines/pubs/pinkbook/index.html](http://www.cdc.gov/vaccines/pubs/pinkbook/index.html). I will make the Pink Book chapters available in D2L Brightspace. The other two books are available in paper copy or as eBooks from a range of book sellers.

**Epidemiology and Prevention of Vaccine-Preventable Diseases**

*The Pink Book: Course Textbook*  
Centers for Disease Control and Protection  

**On Immunity: An Inoculation**

Eula Biss  
Graywolf Press

**Polio an American Story**

David M. Oshinsky  
Oxford University Press

**Supplemental Reading Materials.** We will use a range of supplemental readings throughout this course which include popular media articles and scientific journal articles. These readings materials are available in D2L Brightspace, in the content area.

**Course Description:** This course will introduce students to the field of vaccinology and aspects of the bioscience industry related to vaccine discovery, production, and testing. Students will learn about the history of vaccines; the production of vaccines in a regulated environment; the benefits and concerns with vaccine use. The course will include a discussion of vaccine types, delivery, efficacy, and safety. Students will learn about the mechanism of action of different vaccines; traditional verses modern vaccine production methods, the process of clinical trials and approval for new vaccines; and discuss ethical concerns related to vaccine use.

**Prerequisites:** BIOL 2360.
Student Learning Outcomes:

- describe how various types of vaccines evoke an immune response and provide protective immunity.
- discuss a broad range of vaccine preventable diseases and apply the basic principles of vaccinology to disease prevention.
- summarize the overall principles and key steps of the pharmaceutical clinical development process, from bench to product and provide specific examples.
- explain appropriate techniques for administration of vaccines by intramuscular, subcutaneous, and intranasal routes as well as describe the possible immunological benefits of each method.
- discuss the ethical concerns regarding the vaccine debate and apply these concerns to debates regarding costs, benefits, and risks of vaccination.
- develop an in-depth, thorough understanding of vaccinology and vaccine-induced immunity.
- evaluate the mechanism of action of different vaccines.
- appraise traditional verses modern vaccine production methods.
- list the various regulatory steps for clinical trials and approval for new vaccines.

Course Commitment: Introduction to Vaccinology is a 4 credit combined undergraduate and graduate course.

A 4 credit lecture only course required 60 hours of equivalent class time during a semester. In a 9 week summer course that means that there will be approximately 4 hours of lecture time each week along with structured reading assignments and reading questions which will take 1 to 2 hours. This does not include the time spent studying, taking quizzes or writing exams. I expect students will need to engage in course activities for 2 to 3 hours for each hour of lecture. That means I estimate the weekly time commitment of 18 to 24 hours depending on how effectively you use your time.

Course materials available D2L Brightspace:

- Syllabus and Schedule
- Supplemental Reading Materials
- Recorded Panopto Lectures
- PowerPoint Lectures in both PPT and PDF format
- Study Guides
- Quizzes
- Assignments Location used to upload assignments, exams, and papers
- Announcements and Reminders
- Access to Discussion Functions
- Grades

Study Guides: Available for each lecture topic we will cover. Includes:

- Learning Outcomes
- Terminology List
- Reading Requirements
- Any additional study materials that I feel will be helpful.
### Quizzes
A total of 9 quizzes will required for this course comprising 180 total points. One quiz will be open each week for the 9 weeks of the course.

- The quizzes are designed to evaluate basic knowledge of the topic materials covered in the lecture portion of the class.
- Each quiz will have a defined open window which will run from 8 a.m. Thursday to 8 p.m. Sunday. The quizzes must be completed during that time window. The final quiz will be due on Saturday July 29 at 8 p.m.
- Quizzes will be 20 question and will be worth 20 points. Students have 20 minutes to complete the quizzes and due to the nature of the course, quizzes are considered open note and open book.

### Exams
The course will include 2 exams, a mid-term exam and a final exam each worth 100 points accounting for 200 points towards the final grade.

- These exams will be essay exams that will be word processed and turned in to the D2L Brightspace Assignments.
- The Mid-term Exam will cover material from May 30 through June 24. It will be available Monday June 19 at 8:00 a.m. and will be due in Assignments Sunday June 25 at 8:00 p.m.
- The Final Exam will cover the material from June 25 through July 29. It will be available Monday July 24 at 8:00 a.m. and will be due in Assignments by Saturday July 29 at 8:00 p.m.
- There will be a 10 point deduction per each 24 hours an exam is turned in late. This means that exams turned in at 8:01 p.m. on the due date to 7:59 p.m. the following day will have 10 points deducted from the score. Ten additional points will be deducted for each 24 hour period the exam is late.

### Reading Assignments
There will be two types of reading assignments for this course.

- First the readings that accompany the lecture materials for the course. These reading assignments will come from the CDC Pink Book and a range of journal articles.
- The second will be reading the other two books required for the course; On Immunity: An Inoculation and Polio an American Story; along with supplemental commentaries and articles from the popular press. The purpose of these readings are to provide insight into the public’s concerns with vaccine use and safety as well as a look into the challenges of vaccine development.
- Weekly reading questions will be assigned for the second reading assignments. The week following each reading assignment is due, there will be a lecture provided covering that section of the assignment. Beginning in Week 2, Quizzes will include questions related to the reading assignments.
Weekly Reading Questions:
- There will be 8 different weekly sets of reading questions assigned. Students will need to answer the questions and turn them into Assignments in D2L Brightspace.
- Each of the 8 reading question assignments are worth 20 points accounting for a total of 160 points for the course.
- The reading questions will be posted in D2L and are due in Assignments by Saturday each week at 8:00 p.m.
  5 points will be deducted from your grade for every 24 hours the assignment is late beginning at 8:01 p.m. on the due date.

Class Participation: Class participation in online course is always an interesting concept. We will use the D2L Brightspace Discussion Board.
Discussion Board:
- We will use the discussion board to ask questions and interact about course materials. Students will be required to make a minimum of one original post to the discussion board each week and comment or respond to a minimum of one other post each week, including question that I post.
- These posts can relate to the lecture material, the reading material, or something that you have seen in the news that week relating in some way to vaccines and vaccinology.
- I will check the discussion board at least once each week. Typically Friday or Saturday morning.
- Students will also be required to make a minimum of 2 comments or ask 2 questions per paper for the papers written by the graduate students in the course.
- Participation in the Discussion Board will account for 90 points towards your final grade.

Undergraduate Grades: For the students taking the course as Biology 4470 course grades will be calculated based upon a total of 630 points.

<table>
<thead>
<tr>
<th>Point Breakdown:</th>
<th>Letter grades will be based on a 90%, 80%, 70%, 60% systems:</th>
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</thead>
<tbody>
<tr>
<td>200 points for Exams</td>
<td>A 567 points</td>
</tr>
<tr>
<td>180 points for Quizzes</td>
<td>B 504 points</td>
</tr>
<tr>
<td>160 points for Reading Questions</td>
<td>C 441 points</td>
</tr>
<tr>
<td>90 points for Class Participation</td>
<td>D 378 points</td>
</tr>
</tbody>
</table>
Graduate Requirements: For the students taking the course as Biology 5470 there will be two additional assignments.

- First, graduate students will need to write a paper that will account for 100 points towards your final grade. The topic for the paper should relate to a current infectious disease concern and vaccine development for that disease. Examples of current disease concerns include: Ebola virus, Zika Virus, and Dengue Fever. Paper instructions are provided in the content area of D2L Brightspace. Paper topics will need to be approved.
- Second, graduate students will need to respond to student questions on the discussion board related to their paper topic during the final two weeks of the course. This will account for 25 points towards your final grade.

Graduate Paper Timeline:
- Topics Approved by June 17, 5 points
- Paper Outline Submitted June 24, 20 points
- First Draft Paper due July 1, 25 points
- Final Draft Paper due July 8, 50 points
- Graduate Student Discussion Weeks 8 and 9, 25 points

Graduate Grades: For the students taking the course as Biology 5470 course grades will be calculated based upon a total of 755 points.

Point Breakdown:  | Letter grades will be based on a 92%, 84%, 76%, 68% systems.
--- | ---
200 points for Exams | A  695 points
180 points for Quizzes | B  634 points
160 points for Reading Questions | C  574 points
90 points for Class Participation | D  513 points
100 points for Paper | 
25 points for Discussion Questions | 

Accommodations: Upon request students with a documented disability may receive appropriate and reasonable accommodations in this course including information in an alternate format. Please contact the Disability Services Office at 755-3883 or email disabilitieservices@bemidjistate.edu.

Academic Integrity: BSU students are expected to practice the highest standards of ethics, honesty and integrity in all of their academic work. Any form of academic dishonesty (e.g., plagiarism, cheating and misrepresentation) may result in disciplinary action. Possible disciplinary actions may include failure for part of all of a course as well as suspension from the University.
### Course Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Lecture Topics</th>
<th>Book Assignments</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5/30 to 6/3</td>
<td>• Course Overview: An Introduction to Vaccinology&lt;br&gt;&lt;br&gt;• An Introduction to Reading Question Assignments and A Brief Introduction to On Immunity&lt;br&gt;&lt;br&gt;• History of Vaccines and Vaccination&lt;br&gt;&lt;br&gt;• Immune System Basics&lt;br&gt;&lt;br&gt;• Principles of Vaccination</td>
<td>• Week 1 Reading Questions:&lt;br&gt;  ○ On Immunity: An Inoculation Chapters 1 – 7, Pages 3 – 39&lt;br&gt;  ○ The Fear Factor: Swine Flu and Vaccines&lt;br&gt;  ○ Jenny McCarthy’s Dangerous Views&lt;br&gt; • Assignment Submission&lt;br&gt;  ○ Due 6/3 8 p.m.</td>
<td>Week 1 Quiz&lt;br&gt;  • 8 a.m. Thursday to 8 p.m. Sunday</td>
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<td>2</td>
<td>6/4 to 6/10</td>
<td>• Recommendations on Immunization&lt;br&gt;&lt;br&gt;• Immunization Strategies for Healthcare&lt;br&gt;&lt;br&gt;• Vaccine Safety&lt;br&gt;&lt;br&gt;• Storage and Handling&lt;br&gt;&lt;br&gt;• On Immunity: Reading Questions 1 Commentary.</td>
<td>• Week 2 Reading Questions&lt;br&gt;  ○ On Immunity: An Inoculation Chapters 8 – 14, Pages 40 – 76&lt;br&gt; • Assignment Submission&lt;br&gt;  ○ Due 6/10 8 p.m.</td>
<td>Week 2 Quiz&lt;br&gt;  • 8 a.m. Thursday to 8 p.m. Sunday</td>
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<tr>
<td>3</td>
<td>6/11 to 6/17</td>
<td>• Vaccine Administration&lt;br&gt;&lt;br&gt;• Diphtheria&lt;br&gt;&lt;br&gt;• Pertussis&lt;br&gt;&lt;br&gt;• Tetanus&lt;br&gt;&lt;br&gt;• On Immunity: Reading Questions 2 Commentary.</td>
<td>• Week 3 Reading Questions&lt;br&gt;  ○ On Immunity: An Inoculation Chapter 15 – 21 Pages 77 – 113&lt;br&gt;  ○ Resistant: Why a Century-Old Battle Against Vaccination Continues to Rage&lt;br&gt; • Assignment Submission&lt;br&gt;  ○ Due 6/17 8 p.m.</td>
<td>Week 3 Quiz&lt;br&gt;  • 8 a.m. Thursday to 8 p.m. Sunday&lt;br&gt;  Graduate Student Paper Topics Approved by 6/17 at 8 p.m. Approval by email.</td>
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<tr>
<td>4</td>
<td>6/18 to 6/24</td>
<td>• Measles&lt;br&gt;&lt;br&gt;• Mumps&lt;br&gt;&lt;br&gt;• Rubella</td>
<td>• Week 4 Reading Questions&lt;br&gt;  ○ On Immunity: An Inoculation Chapter 21 - 30</td>
<td>Week 4 Quiz&lt;br&gt;  • 8 a.m. Thursday to 8 p.m. Sunday&lt;br&gt;  Mid-Term Exam</td>
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<td></td>
<td>Varicella</td>
<td>On Immunity: Reading Questions Commentary.</td>
<td>Pages 110 – 163</td>
<td>Assignment Submission</td>
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<td>Due 6/24 8 p.m.</td>
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<td></td>
<td>A Brief Introduction to Polio an American Story</td>
<td>Week 5 Reading Questions</td>
<td>Available Monday June 19 at 8:00 a.m.</td>
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<td>5</td>
<td>6/25 to 7/1</td>
<td>Polio: An American Story Introduction to Chapter 4</td>
<td>Due in Assignment Sunday June 25 at 8:00 p.m.</td>
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<td></td>
<td>Meningococcal Disease</td>
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<td>Graduate Student Paper Outline Due by 6/24 at 8 p.m. in Assignments</td>
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<td></td>
<td>Pneumococcal Disease</td>
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<td>User: User Text</td>
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<td></td>
<td>Haemophilus influenza</td>
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<td></td>
<td>Human Papilloma Virus</td>
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<td>User: User Text</td>
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<td></td>
<td>On Immunity: Reading Questions Commentary.</td>
<td>Assignment Submission</td>
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<td>Due 7/1 8 p.m.</td>
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<td></td>
<td>Poliomyelitis</td>
<td>Week 6 Reading Questions</td>
<td>Week 5 Quiz</td>
<td>8 a.m. Thursday to 8 p.m. Sunday</td>
</tr>
<tr>
<td>6</td>
<td>7/2 – 7/8</td>
<td>Polio: An American Story Chapter 5 to Chapter 9</td>
<td>Graduate Student Paper First Draft Due 7/1 at 8 p.m. in Assignment</td>
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<tr>
<td></td>
<td>Rota Virus</td>
<td>Pages 79 - 160</td>
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<td></td>
<td>Hepatitis A</td>
<td>Assignment Submission</td>
<td>Week 6 Quiz</td>
<td>8 a.m. Thursday to 8 p.m. Sunday</td>
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<tr>
<td></td>
<td>Hepatitis B</td>
<td>Due 7/8 8 p.m.</td>
<td>Graduate Student Paper Final Draft Due 7/8 at 8 p.m. in Assignment</td>
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<td></td>
<td>Polio an American Story: Reading Question 5 Commentary</td>
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<tr>
<td>Week</td>
<td>Dates</td>
<td>Lecture Topics</td>
<td>Book Assignments</td>
<td>Assignments</td>
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<tr>
<td>7</td>
<td>7/9 – 7/15</td>
<td>• Influenza</td>
<td>• Week 7 Reading Questions</td>
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<tr>
<td></td>
<td></td>
<td>• Influenza Vaccines and Recommendations</td>
<td>• Polio: An American Story Chapter 10 to Chapter 13 Pages 161 - 236</td>
<td>Week 7 Quiz</td>
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<td></td>
<td>• Influenza Vaccine Production</td>
<td>• Assignment Submission</td>
<td>• 8 a.m. Thursday to 8 p.m. Sunday</td>
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<td></td>
<td></td>
<td>• Polio an American Story: Reading Question 6 Commentary</td>
<td>• Due 7/15 8 p.m.</td>
<td>Graduate Student Papers Available to Undergraduates 7/15</td>
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<td>8</td>
<td>7/16 – 7/22</td>
<td>• New Vaccine Technology for Influenza Vaccines</td>
<td>• Week 8 Reading Questions</td>
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<tr>
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<td>• Universal Influenza Vaccines</td>
<td>• Polio: An American Story Chapter 14 to Epilogue Pages 237 - 288</td>
<td>Week 8 Quiz</td>
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<td></td>
<td></td>
<td>• The Basics of Pharmaceutical Development</td>
<td>• Assignment Submission</td>
<td>• 8 a.m. Thursday to 8 p.m. Sunday</td>
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<tr>
<td></td>
<td></td>
<td>• The Basics of Vaccine Development and FDA Guidance</td>
<td>• Due 7/22 p.m.</td>
<td>Graduate Student Response to Discussion Questions on Discussion Board</td>
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<tr>
<td></td>
<td></td>
<td>• Polio an American Story: Reading Question 7 Commentary</td>
<td>• Due 7/22 p.m.</td>
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<tr>
<td>9</td>
<td>7/23– 7/29</td>
<td>• The History of the Anti-vaccination Movement</td>
<td>• Week 9 Quiz</td>
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<tr>
<td></td>
<td></td>
<td>• The Myth of Vaccinations and Autism</td>
<td>• 8 a.m. Thursday to 8 p.m. Saturday</td>
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<tr>
<td></td>
<td></td>
<td>• Polio an American Story: Reading Question 8 Commentary</td>
<td>• Graduate Student Response to Discussion Questions on Discussion Board</td>
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<td></td>
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<td></td>
<td>• Final Exam</td>
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<td>• Available Monday July 24 at 8:00 a.m.</td>
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<td></td>
<td>• Due in Assignment Saturday July 29 at 8:00 p.m.</td>
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</tbody>
</table>
New Course Form

Course Number:
   Undergraduate: **BIOL 4715**
   Graduate:

Course Title: **Clinical Microbiology**

Course Description: **Clinical techniques used to identify medically important microorganisms will be examined. Correlate the presence of microorganisms to health and disease. Prerequisite(s): **BIOL 3710.**

Credits: 3

Prerequisite(s):
   Undergraduate: **BIOL 3710 Microbiology**
   Graduate:

1. Reason(s) for creating this course: The reason to create this course is to better prepare students for performing and understanding clinical microbiology techniques and the importance of these techniques. This is especially relevant for Medical Laboratory Science majors and students intending in pursuing a medical career.

2. How often will this course be offered? **Every Spring Semester**

3. What are the student learning outcomes for the course (please precede each outcome with "Students will...")?
   1. Students will evaluate, assess, and characterize microorganisms as either normal flora or pathogens.
   2. Students will compare and contrast the major microbial pathogens in humans.
   3. Students will correlate microorganism isolation with possible disease states.
   4. Students will evaluate methods of disease prevention.
   5. Students will formulate a process necessary to perform microbiology procedures, including culturing, gram staining, identification testing, and antibiotic susceptibility testing.

4. What are the major content areas for the course?
   The major content areas include infection control, specimen collection methods, isolation of microbes, susceptibility testing and antibiotic resistance, and identification procedures for medically important microbes and examination of their pathogenicity.

5. Is this course repeatable for credit, and if so, what is the maximum number of credits that can be earned? **Not repeatable.**
6. If this course is intended primarily for off-campus delivery (not offered on campus), what delivery mechanism will be used? **Center for Extended Learning – D2L and Proctored exams**

7. What is the projected maximum class size (cap)? **20**

8. What qualified faculty will be available to teach this course? **Dr. Holly LaFerriere**

   NOTE WELL: Department and dean, in approving this proposal, attest both to the adequacy of the qualifications of faculty here named, and to their availability to teach the course at the frequency specified above, without excessive overload or disruption to other curriculum.

9. What additional library and other resources need or should be provided for this course, that are not already available? **None**

10. What special personal property or service fee(s) would be charged to students taking this course? These charges would be for 1) items that are retained by the student and have an educational or personal value beyond the classroom, or 2) services that are on the student’s behalf (see MnSCU Board Policy 5.11).

   Amount per student: **$15/credit**

   For: **Biology Approved Differential Tuition Fee**

11. Attach a sample syllabus for the course. Note: if this course is double-numbered (u-grad/grad), the syllabus must include an additional component for graduate students.
BIOL 4715 Clinical Microbiology  (3 credits)
Spring Semester, 2017

Instructor: Holly LaFerriere, Ph.D.
Office: Sattgast 218N
Phone: 218-755-2946
Email: HLaFerriere@bemidjistate.edu (Preferred)
Office Hours: M 9AM & 11AM-2PM, T 1PM, W 9AM-Noon, and F 9AM & 11AM

Course Description
Clinical techniques used to identify medically important microorganisms will be examined. Correlate
the presence of microorganisms to health and disease.

Prerequisites: BIOL 3710 Microbiology


Student Learning Outcomes:
1. Evaluate, assess, and characterize microorganisms as either normal flora or pathogens.
2. Compare and contrast the major microbial pathogens in humans.
3. Correlate microorganism isolation with possible disease states.
5. Formulate a process necessary to perform microbiology procedures, including culturing, gram
staining, identification testing, and antibiotic susceptibility testing.

Grading: Grades will be based on exams, quizzes and discussions.
200 points exams – one midterm and one final exam
200 points discussion – 1 or 2 discussion/collaborative assignments each week
130 points quizzes - one quiz each week
530 points total

NOTE: Other graded assignments may occur during the semester.

Grades will be based on the following scale of percentages:
100-90.00%=A; 89.99-80%=B; 79.99-70.00%=C; 69.99-60.00%=D; below 60.00%=Fail.

Online materials: I will use the Desire 2 Learn (D2L) website to interact with students during this
online course. Emails are sent to your BSU account—PLEASE check this account regularly. The D2L
website address is: https://bemidjistate.ims.mnscu.edu/ Log in using your user name and password and
click on “Clinical Microbiology” under the courses listed at the bottom of the page. Course materials
will be available under the “content” tab. Your grades will be available under the “grades” tab.

Instructor policies
Profanity or improper conduct of any kind will not be tolerated.

Assignment Deadlines
Assignments handed in after the due date, may receive reduced credit or not be accepted at all.

Exams
Exams will be proctored through extended learning. More details on this to come.

Academic Integrity Statement
BSU students are expected to practice the highest standards of ethics, honesty and integrity in all of their academic work. Any form of academic dishonesty (e.g., plagiarism, cheating and misrepresentation) may result in disciplinary action. Possible disciplinary actions may include failure for part or all of a course as well as suspension from the University.

Students with Disabilities
Upon request students with a documented disability may receive appropriate and reasonable accommodations in this course including information in an alternate format. Please contact the Disability Services Office at 755-3883 or email disabilityservices@bemidjistate.edu.

Mental Health Statement
You may experience mental health concerns or stressful events that may lead to diminished academic performance. The Student Center for Health & Counseling is available to assist you with concerns.

Date: Tentative Class Schedule (subject to change with notice)

Week 1
Review of basic microbiology and laboratory role in infection control.

Week 2
Specimen collection methods and media for specific microbe isolation.

Week 3
Review gram staining and microscopy and correlate colony morphology with potential bacterial pathogens. Susceptibility testing and antibiotic resistance.

Week 4
Laboratory procedures for identification of Staphylococcus species and pathogenicity of Staphylococcus species.

Week 5
Laboratory procedures for identification of Streptococcus species and pathogenicity of Streptococcus species.

Week 6
Laboratory procedures for identification of the Enterobacteriaceae group and pathogenicity of the Enterobacteriaceae group.

Week 7
Laboratory procedures for identification of Neisseria species and pathogenicity of Neisseria species.
Week 8
Laboratory procedures for identification of Haemophilus species and pathogenicity of Haemophilus species.

Week 9
Laboratory procedures for the identification of nonfermentative gram-negative bacilli.

Week 10
Laboratory procedures for the identification of gram-negative bacilli and pathogenicity of gram negative rods other than Haemophilus and Enterobacteriaceae.

Week 11
Laboratory procedures for the identification of gram positive rods and summarize pathogenicity of gram positive rods.

Week 12
Laboratory procedures for the identification of anaerobes and summarize pathogenicity of anaerobes.

Week 13
Laboratory procedures for the identification of Spirochetes, Chlamydia, Mycoplasma, and Rickettsia and summarize their pathogenicity.

Week 14
Laboratory procedures for the identification of Mycobacterium and summarize their pathogenicity.

Week 15
Laboratory procedures for the identification of viruses and summarize their pathogenicity.
BSU Curriculum Forms

Form 3
Updated 9.19.15

New Course Form

Course Number:
  Undergraduate: CHEM 4614
  Graduate: CHEM 5614

Course Title: Medicinal Chemistry: Drug Design

Course Description:
This course focuses on drug design and development, as well as the absorption, distribution, metabolism and excretion of drug molecules. Organic chemistry principles vital to drug synthesis and case studies of clinically relevant drugs will be incorporated. Prerequisite(s): CHEM 3312.

Credits: 3 cr

Prerequisite(s):
  Undergraduate: CHEM 3312 (Organic Chemistry II)
  Graduate: Degree in Biology, Chemistry, or related field.

1. Reason(s) for creating this course:
Addition of a medicinal chemistry course to the curriculum will increase relevant upper level course offerings for students in pre-professional programs. This course is ideal for students with health science interests (pre-Medicine, pre-pharmacy, medicinal chemistry, or biomedical science). Plus, offering of a course in medical chemistry (either drug design or drug action) each semester will be unique to BSU among MN State schools and allow the recruitment of students into the new Biochemistry, Cellular, and Molecular Biology (BCMB) degree. Additionally, the organic chemistry (CHEM 3311) prerequisite for this course qualifies it as an advanced course for American Chemical Society (ACS) certification. (The ACS requires students take at least 2 advanced courses to complete their undergraduate curriculum.) Thus, this course is a component of both the BCMB and the Chemistry, ACS degree in which students apply information from previous courses to drug design.

2. How often will this course be offered?
   Once every academic year, fall semester.

3. What are the student learning outcomes for the course (please precede each outcome with "Students will...")?
   ▪ Students will summarize the steps of drug discovery including identifying a lead compound and selecting an appropriate assay to measure biological activity.
   ▪ Students will describe how drug absorption, distribution within the body, metabolism, and excretion relate to the chemical structure of drug molecules and provide examples of how drugs are designed to optimize these pharmacokinetic parameters.
• Students will discuss the importance of hydrophobic/hydrophilic properties of drugs, predict these properties based on their structure and propose structural changes to alter these properties.
• Students will construct modified drugs to optimize interactions with the target and to promote favorable pharmacokinetics (for example, more or less easily absorbed, more or less resistant to metabolism and the use of prodrugs).
• Students will explain the process of getting a drug to market including the patent process to protect intellectual property and clinical trials.

4. What are the major content areas for the course?
   Major content areas for this course are rooted in organic chemistry, biochemistry, physiology, cell biology and pharmacology. Specific topics include properties of functional groups, pharmacokinetics (drug absorption, distribution, metabolism, and elimination), drug discovery (identifying and optimizing lead compounds), structure activity relationships, aspects in pharmaceutical synthesis, clinical trials, and the FDA approval process.

5. Is this course repeatable for credit, and if so, what is the maximum number of credits that can be earned? No

6. If this course is intended primarily for off-campus delivery (not offered on campus), what delivery mechanism will be used? This course is intended for on-campus delivery.

7. What is the projected maximum class size (cap)? 30 students

8. What qualified faculty will be available to teach this course?
   Dr. Katie Peterson is qualified to teach this course and has taught it as an experimental course Fall 2015 and Fall 2016. She obtained her Ph.D. in Chemistry, with an emphasis in chemical biology from the University of Minnesota. Her graduate curriculum included courses in medicinal chemistry and chemical biology, and her interdisciplinary thesis research involved organic synthesis, bioanalytical analysis, and cell assays.

NOTE WELL: Department and dean, in approving this proposal, attest both to the adequacy of the qualifications of faculty here named, and to their availability to teach the course at the frequency specified above, without excessive overload or disruption to other curriculum.

9. What additional library and other resources need or should be provided for this course, that are not already available? none

10. What special personal property or service fee(s) would be charged to students taking this course? These charges would be for 1) items that are retained by the student and have an educational or personal value beyond the classroom, or 2) services that are on the student’s behalf (see MnSCU Board Policy 5.11).
   Amount per student: $ 0
   For: none

11. Attach a sample syllabus for the course. Note: if this course is double-numbered (u-grad/grad), the syllabus must include an additional component for graduate students.
# Medicinal Chemistry: Drug Design (CHEM 4614 / 5614)

**Instructor:** Dr. Katie Peterson  
**Email:** KPeterson@bemidjistate.edu  
**Phone:** 218-755-3880  
**Office:** 377C Sataggast Hall

**Office Hours:**  
- TBD  
- Whenever my office door is open  
- By appointment

**Lecture**  
Monday, Wednesday, Friday  
9:00 - 9:50  
Memorial 260

## Background

Most people have benefited from the discoveries of medicinal chemists in order to relieve pain, fight a bacterial infection, or combat cancer. The process of identifying and developing drugs and understanding the mechanisms by which they act in the body combines the disciplines of organic chemistry, biochemistry, physiology, cell biology, and pharmacology.

**Course Description:** This course focuses on drug design and development, as well as the absorption, distribution, metabolism and excretion of drug molecules. Organic chemistry principles vital to drug synthesis and case studies of clinically relevant drugs will be incorporated.

**Prerequisites:** CHEM 3312 (Organic Chemistry II)

**Required Materials:**
- **Textbook.** *An Introduction to Medicinal Chemistry* by Graham Patrick.  
  - Available in the BSU bookstore and at Amazon.com for ~ $63 (new).

**Supplementary Texts:** (I have a copy of each in my office, and there is a copy on reserve at the library.)

**Web Resources:** The D2L Brightspace online course management system will be used to post announcements, lecture notes, problem sets, and answer keys to class activities. Please check this course site frequently!

**Key points about this course:**
- Don’t fall behind - the material builds on previous information. Concepts learned in the first weeks of class will be used throughout the entire course.  
- Some topics will be discussed in more detail than others; pay attention in class and to the assigned sections.  
- The field of medicinal chemistry contains many drug names and scientific/medical terminology, and we will not discuss it all. *Don’t get overwhelmed by the jargon when reading.*
Course Goals and Learning Outcomes

The overall goals of this course are to:

- Appreciate the process of drug design and optimization.
- Understand how drugs are designed to interact with specific targets.

By the end of this course, students will be able to:

- Summarize the steps of drug discovery including identifying a lead compound and selecting an appropriate assay to measure biological activity.
- Describe how drug absorption, distribution within the body, metabolism, and excretion relate to the chemical structure of drug molecules and provide examples of how drugs are designed to optimize these pharmacokinetic parameters.
- Discuss the importance of hydrophobic/hydrophilic properties of drugs, predict these properties based on their structure and propose structural changes to alter these properties.
- Construct modified drugs to optimize interactions with the target and to promote favorable pharmacokinetics (for example, more or less easily absorbed, more or less resistant to metabolism and the use of prodrugs).
- Explain the process of getting a drug to market including the patent process to protect intellectual property and clinical trials.

CLASSWORK and EXAMS

Group Activities, Problem Sets, and Case Studies: Activities taking the form of problem sets, case studies, online activities, or literature reviews will allow you to apply the concepts discussed in lecture. You are encouraged to work together. Some activities will be graded individually and others will receive a group grade. Some will be due at the end of the class period and others you can finish prior to the start of the next class period. Your total activity points throughout the semester will be applied to your final grade. A maximum of 145 points can count towards your grade, but throughout the semester more points will be offered. In other words, you don’t need to get every question right in order to get all the points. There will be no opportunities to makeup missed activities.

Problem Sets: A list of problems will be provided for you to apply the material discussed in class. Although these will not be collected or graded, you should strive to work as many of the problems as possible to improve their understanding of course material. Also, related problems (or possibly identical ones!) may appear on exams. You are encouraged to discuss them with peers and the instructor.

Pharmaceuticals Research Project: Each student will research a drug molecule and summarize the structure and pharmacokinetic properties of the drug in a paper. You will also give a presentation (15 min) on the drug to the class. Pharmaceuticals will be selected by the student, and each student must investigate a different drug. A detailed description of the project will be provided. Students taking this course at the graduate level (CHEM 5320) will research several drugs with a shared mode of action. The work will culminate in a paper and presentation (30 min).

Attendance: Regular attendance and paying attention in class is essential for success in this course. Even though attendance is not formally incorporated into the course grade, many group activities completed during the class period will be graded. It is the student's responsibility to obtain course materials such as notes, hand-outs, and announcements presented in their absence.

Exams: In this course, there are three (3) unit exams, each worth 100 points and one (1) mini-exam worth 50 points. Graduate students will answer additional questions on exams (for a total of 115 points per exam). Exams will be based on material discussed in class, the assigned readings, class activities, and problem sets. Questions will
primarily short answer with some multiple choice, matching, and fill in the blank. Notes, textbooks, and electronic devices, such as cell phones, ipods, etc., will not be allowed. No extra time will be granted to latecomers, so BE ON TIME!

Exam Point Recapture: Exams test your understanding, but can also help you learn. To “recapture” points lost on a unit exam, submit a written summary within one (1) week of receiving the exam grade that includes:

1. The full exam question and number.
2. Why your answer was incorrect.
3. The correct answer supported by either a citation from your notes or text that helped you determine the correct answer or the “work” or calculations you used to solve the problem.

Adequate written responses will allow you to regain 50% of the lost points (If you answered a 10 point question incorrectly, you can “recapture” 5 points.) A maximum of 10 points can be added to any unit exam, so you have the opportunity to raise your score by one letter grade.

Make-up Exam Policy: Students are expected to be prepared and present at the predetermined exam and presentation times. There will be NO make-ups for unexcused absences!

You may be excused from taking an exam due to jury duty, military service, participation in school sports event, or other excused absences only if: 1) the instructor is notified two weeks in advance, and 2) the required documentation is provided. You may also be excused in case of illness (as verified by a doctor's note) or death in the immediate family (be prepared to verify) if the instructor is notified within 24 hours after the exam.

If an exam is missed due to extraordinary circumstances (e.g. hospitalization) or University-related activities, and supporting documentation is provided, an opportunity for a make-up exam will be give or the missed exam score will be replaced by the average score for the other unit exams. An unexcused absence from any of the hour exams or final will result in a score of zero for that exam.

Late Work Policy: Assignments are expected to be completed on time. Every day the work is handed in late the total score will be decreased by 5% (meaning a maximum score of 95% is possible when 1 day late, 90% when 2 days late, etc.) up to 7 days. After, 1 week the assignment will receive zero.

<table>
<thead>
<tr>
<th>Component</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syllabus Quiz</td>
<td>5</td>
</tr>
<tr>
<td>Exams</td>
<td>300</td>
</tr>
<tr>
<td>Mini Exam</td>
<td>50</td>
</tr>
<tr>
<td>Pharmaceuticals Project</td>
<td>175</td>
</tr>
<tr>
<td>Class Activities</td>
<td>145</td>
</tr>
<tr>
<td>Peer Feedback</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>700</td>
</tr>
</tbody>
</table>

Grades: The grade for this course includes exams, class activities, a written paper, a presentation, and providing feedback to classmates on their presentations. Grades will be assigned based on the percent of total points earned. The grading scale may be adjusted so the class average is at (or above) the C grade; the brackets will only be lowered, never raised, meaning a 90% will always earn an A. The final paper and presentation must be completed to pass the course.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percent Earned</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (excellent)</td>
<td>90 - 100 %</td>
</tr>
<tr>
<td>B (above average)</td>
<td>80 - 89 %</td>
</tr>
</tbody>
</table>
Please double check that the correct grades are entered into the on-line grading system.

Re-Grade Policy: If you do not understand how a particular question of assignment was graded, you may talk to me about it. Re-grades requests are intended to correct grading errors, not for negotiating a higher grade. When work is submitted for re-grade, the entire work may be re-graded.

Please follow these instructions, if you honestly believe a grade should be reconsidered:

1. Wait at least 24 hour after receiving the grade, but no more than one week.
2. Submit to me your original graded exam or assignment and a written explanation containing specific rationale for why your answer is correct or why you believe your work deserves a higher grade. ("I think I deserve a better grade" is not a valid rationale.)

Extra Credit: There will not be extra credit in this class. Please use your time working on the material, readings and problems. If your grade is not meeting your goal, please come talk to me so I can offer some strategies to help you succeed at learning the material.

EXPECTATIONS

Instructor Roles
As your instructor, I will:

- Treat you with respect.
- Create a classroom environment where everyone is comfortable.
- Organize lectures and activities that help you learn the course material.
- Provide feedback on your progress, and accept feedback on my performance.
- Be open to student suggestions and ideas.

Student Roles
As a student in this class you are expected to:

- Respect your classmates and instructor; treat everyone fairly, participate in group activities, and do not distract others from learning.
- Be prepared for class and have work completed on time.
- Reduce the following distractions:
  - Coming to class late or leaving early.
  - Ringing cell phones. Please turn phones off or to silent.
  - Texting or browsing the internet.
  - Intimidating or aggressive behavior.
  - Talking with neighbors and off-task behavior.

The environment of our classroom should promote the academic achievement of all members. Students whose behavior is disruptive to the learning environment will be asked to leave. The full student conduct code is available here: http://www.bemidjistate.edu/students/handbook/

Credits and Workload: Learning takes time and hard work. For undergraduate courses, one credit is defined as equivalent to an average (over the semester) to three hours of learning effort per week for an average student to
achieve an average grade. Thus, for this course, a student with an average level of preparation should expect to spend an additional 6 hours a week on course work outside of the classroom to achieve a passing grade.

**Academic Integrity Statement:** BSU students are expected to practice the highest standards of ethics, honesty and integrity in all of their academic work. Any form of academic dishonesty may result in disciplinary action. Possible disciplinary actions may include failure for part of all of a course as well as suspension from the University.

Academic dishonesty includes plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis.

Please ask if you have any questions about the expectations of an assignment or exam.

**HELP**

To be successful in this course:
- Read the material before class. Note what is confusing/unclear to you.
- Review notes after lecture and re-read sections of the text.
- Do the suggested problems.
- Study for exams. At a minimum, review your notes, course activities and homework problems.
- Determine common themes between the readings, activities, and homework problems.
- Get additional help from the instructor if needed.

Ask the Instructor: If you need help with the course material, come see me! I am willing to answer questions on course content, provide feedback on assignments, activities, review suggested problems, and devise study plans…or just chat about chemistry.

Other Resources: The textbook’s online resource center ([http://global.oup.com/uk/orc/chemistry/patrick5e/](http://global.oup.com/uk/orc/chemistry/patrick5e/)) provides multiple choice questions for each chapter and additional student resources such as rotatable structures. In my office, I have a small collection of medicinal chemistry and biochemistry textbooks. I am willing to let you have access to these books for an evening, provided you sign them out.

Student Mental Health and Stress Management: As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. At BSU, the Student Center for Health and Counseling (755-2053) is available to assist you with concerns. You can learn more about the broad range of mental health services available on campus at [http://www.bemidjistate.edu/students/services/health_counseling/](http://www.bemidjistate.edu/students/services/health_counseling/)

Disability Services: Upon request students with a documented disability may receive appropriate and reasonable accommodations in this course including information in an alternate format. Please contact the Disability Services Office at 755-3883 or email disabilityservices@bemidjistate.edu.
COURSE SCHEDULE

This outline of course topics is subject to change. Any modifications will be announced in class.

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Readings</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Aug 22</td>
<td>M Introduction, Syllabus</td>
<td>GP Ch 1</td>
<td></td>
</tr>
<tr>
<td>1 Aug 24</td>
<td>W Functional groups</td>
<td>Harrold Ch 2 &amp; 3</td>
<td></td>
</tr>
<tr>
<td>1 Aug 26</td>
<td>F Chemical properties of functional groups</td>
<td>Harrold Ch 2 &amp; 3</td>
<td>Survey and Syllabus Quiz</td>
</tr>
<tr>
<td>2 Aug 29</td>
<td>M Intermolecular forces (IMFs)</td>
<td>GP 1.3</td>
<td></td>
</tr>
<tr>
<td>2 Sept 2</td>
<td>F Mini Exam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Sept 5</td>
<td>M NO CLASS – Labor day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Sept 7</td>
<td>W A trip through the body</td>
<td>GP 11.1, 11.2 &amp; Stevens Ch 3</td>
<td></td>
</tr>
<tr>
<td>3 Sept 9</td>
<td>F Pharmacokinetics: Absorption, Lipinski’s rules, distribution</td>
<td>GP 11.3, 11.4</td>
<td></td>
</tr>
<tr>
<td>4 Sept 12</td>
<td>M Pharmacokinetics: Metabolism (phase 1)</td>
<td>GP 11.5</td>
<td></td>
</tr>
<tr>
<td>4 Sept 14</td>
<td>W Pharmacokinetics: Metabolism (phase 2) and elimination</td>
<td>GP 11.5 and 11.6</td>
<td></td>
</tr>
<tr>
<td>5 Sept 19</td>
<td>M Pharmacokinetic calculations</td>
<td>Stevens Ch 7</td>
<td></td>
</tr>
<tr>
<td>5 Sept 21</td>
<td>W Dosing and formulation</td>
<td>GP 11.8 and 11.9</td>
<td></td>
</tr>
<tr>
<td>5 Sept 23</td>
<td>F Activity: Calculations and Dosing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Sept 26</td>
<td>M EXAM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Sept 28</td>
<td>W Drug discovery, selecting a drug target</td>
<td>GP 12.1 – 12.2</td>
<td></td>
</tr>
<tr>
<td>6 Sept 30</td>
<td>F Bioassays</td>
<td>GP 12.3 – 12.3.5</td>
<td></td>
</tr>
<tr>
<td>7 Oct 3</td>
<td>M Lead compounds</td>
<td>GP 12.4 and Stevens Ch 10</td>
<td></td>
</tr>
<tr>
<td>7 Oct 5</td>
<td>W Structure activity relationships (SAR), binding roles of functional groups, isosteres</td>
<td>GP 13.1 and GP Appendix 8</td>
<td></td>
</tr>
<tr>
<td>7 Oct 7</td>
<td>F Pharmacophores</td>
<td>GP 13.2, 17.11 and Stevens 11.1</td>
<td></td>
</tr>
<tr>
<td>8 Oct 10</td>
<td>M Activity: SAR and pharmacophores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Oct 12</td>
<td>W Computers in Med Chem: 3D structures &amp; properties</td>
<td>GP 17.1-17.9, 17.11</td>
<td></td>
</tr>
<tr>
<td>8 Oct 14</td>
<td>F Activity: Pharmacophore of sweeteners (Spartan) → meet in 377 computer lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Oct 17</td>
<td>M Drug optimization: extend and contract, rings</td>
<td>GP 13.3.1 – 13.3.6 Stevens 11.2-11.3</td>
<td></td>
</tr>
<tr>
<td>9 Oct 19</td>
<td>W Drug optimization: isosteres, simplify and rigidify</td>
<td>GP 13.3.7 – 13.3.10</td>
<td></td>
</tr>
<tr>
<td>9 Oct 21</td>
<td>F Activity: Drug discovery and optimization</td>
<td>Spartan Activity</td>
<td></td>
</tr>
<tr>
<td>10 Oct 24</td>
<td>M EXAM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Oct 26</td>
<td>W Drug design: Optimize polarity, log P</td>
<td>GP 14.1</td>
<td></td>
</tr>
<tr>
<td>10 Oct 28</td>
<td>F Quantitative measures of hydrophobicity</td>
<td>GP 18.1-18.2.2</td>
<td></td>
</tr>
<tr>
<td>11 Oct 31</td>
<td>M Altering metabolism</td>
<td>14.2-5, 14.6</td>
<td></td>
</tr>
<tr>
<td>Nov 2</td>
<td>W Prodrugs (and drug targeting, if time)</td>
<td>14.5 (14.4)</td>
<td>Drug Selection</td>
</tr>
<tr>
<td>Nov 4</td>
<td>F Activity: Drug optimization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Nov 7</td>
<td>M Synthesis: Combinatorial and parallel</td>
<td>GP 16</td>
<td></td>
</tr>
<tr>
<td>12 Nov 9</td>
<td>W Aspects in pharmaceutical synthesis, solids</td>
<td>Stevens 13 and GP 11.9</td>
<td></td>
</tr>
<tr>
<td>Nov 11</td>
<td>F NO CLASS – Veteran’s Day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Nov 14</td>
<td>M Aspects in pharmaceutical synthesis, stereochromy</td>
<td>Stevens 13</td>
<td>Detailed Outline</td>
</tr>
<tr>
<td>Nov 16</td>
<td>W Activity: Aspects in synthesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nov 18</td>
<td>F EXAM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nov 21-25</td>
<td>NO CLASS – Fall Break</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Nov 28</td>
<td>M Getting the drug to market: Clinical trials, patents, and regulatory affairs</td>
<td>GP 15</td>
<td></td>
</tr>
<tr>
<td>Nov 30</td>
<td>W Presentations</td>
<td>Presentations</td>
<td></td>
</tr>
<tr>
<td>Dec 2</td>
<td>F Presentations</td>
<td>Presentations</td>
<td></td>
</tr>
<tr>
<td>15 Dec 5</td>
<td>M Presentations</td>
<td>Presentations</td>
<td></td>
</tr>
<tr>
<td>R Dec 8</td>
<td>R Final Paper (No exam) Due Thursday, Dec. 8th to the D2L dropbox before 11:59 PM</td>
<td>Paper Due</td>
<td></td>
</tr>
</tbody>
</table>
New Course Form

Course Number:
- Undergraduate: CHEM 4615
- Graduate: CHEM 5615

Course Title: Medicinal Chemistry: Drug Action

Course Description:
This course focuses on drug targets such as enzymes, receptors, and nucleic acids and the mechanisms by which pharmaceuticals alter the normal cellular activity. Common classes of pharmaceuticals (antibacterial, antiviral, anticancer, opioids, etc) will be explored. Progress in pharmaceutical development will be highlighted through the incorporation of current literature article and drugs undergoing clinical trials. Prerequisite(s): CHEM 4411.

Credits: 3 cr

Prerequisite(s):
- Undergraduate: CHEM 4411 (Biochemistry I)
- Graduate: Degree in Biology, Chemistry, or related field.

1. Reason(s) for creating this course:
This course is designed primarily for students with health science interests (pre-Medicine, pre-pharmacy, medicinal chemistry, or biomedical science) and increases relevant upper level course offerings for students in pre-professional programs. Plus, offering of a course in medical chemistry (either drug design or drug action) each semester will be unique to BSU among MN State schools and allow the recruitment of students into the new Biochemistry, Cellular, and Molecular Biology (BCMB) degree. Additionally, the biochemistry (CHEM 4411) prerequisite for this course qualifies it as an advanced course for American Chemical Society (ACS) certification. (The ACS requires students take at least 2 advanced courses to complete their undergraduate curriculum.) Thus, this course is a component of both the BCMB and the Chemistry, ACS degree in which students apply information from previous courses to drug action.

2. How often will this course be offered?
Once every academic year, spring semester.

3. What are the student learning outcomes for the course (please precede each outcome with "Students will...")?
- Students will identify and diagram covalent and non-covalent interactions within proteins and nucleic acids, and those between biomolecules and drugs.
- Students will classify the main biological targets of drugs and provide examples of how they interact with their targets.
- Students will recognize different types of enzyme inhibitors, diagram enzyme inhibitor mechanisms, and explain how enzyme activity is regulated.
- Students will investigate the structural and functional types of receptors and the types of molecules (agonists vs. antagonists) that bind receptors, as well as relate the binding of molecules to receptors to downstream signaling effects.
- Students will differentiate the methods that drugs use to bind nucleic acid targets.
- Students will examine and summarize the common modes of action of antibacterials, antivirals, anticancer compounds, drugs that affect the peripheral or central nervous system, and opioids.

4. What are the major content areas for the course?
   **Major content areas for this course build on student’s prior knowledge in biochemistry and cell biology. Specific topics include protein structure, enzyme function (catalysis mechanisms, inhibition, and kinetics), receptor activation and signal transduction (of ion channels, G-protein coupled receptors, and tyrosine kinase-linked receptors), using agonists and antagonists to target drug receptors, nucleic acid structure and replication, and drugs that target nucleic acids (intercalators, alkylators, and chain terminators). Additional topics, selected by the students include, applications of the above drug action classes to the development of antibacterials, antivirals, anticancer compounds, drugs that affect the peripheral or central nervous system, and opioids.**

5. Is this course repeatable for credit, and if so, what is the maximum number of credits that can be earned?
   No

6. If this course is intended primarily for off-campus delivery (not offered on campus), what delivery mechanism will be used?
   This course is intended for on-campus delivery.

7. What is the projected maximum class size (cap)?
   **30 students**

8. What qualified faculty will be available to teach this course?
   **Dr. Katie Peterson is qualified to teach this course and has taught it as an experimental course Spring 2016 and Spring 2017. She obtained her Ph.D. in Chemistry, with an emphasis in chemical biology from the University of Minnesota. Her graduate curriculum included courses in medicinal chemistry and chemical biology, and her interdisciplinary thesis research involved organic synthesis, bioanalytical analysis, and cell assays.**

9. What additional library and other resources need or should be provided for this course, that are not already available?
   none
10. What special personal property or service fee(s) would be charged to students taking this course? These charges would be for 1) items that are retained by the student and have an educational or personal value beyond the classroom, or 2) services that are on the student’s behalf (see MnSCU Board Policy 5.11).
Amount per student: $0
For: None

11. Attach a sample syllabus for the course. Note: if this course is double-numbered (u-grad/grad), the syllabus must include an additional component for graduate students.
Most people have benefited from the discoveries of medicinal chemists in order to relieve pain, fight a bacterial infection, or combat cancer. The mechanisms by which drugs act in the body combines the disciplines of organic chemistry, biochemistry, physiology, cell biology, and pharmacology.

Course Description: This course focuses on drug targets such as enzymes, receptors, and nucleic acids and the mechanisms by which pharmaceuticals alter the normal cellular activity. Common classes of pharmaceuticals (antibacterial, antiviral, anticancer, opioids, etc) will be explored. Progress in pharmaceutical development will be highlighted through the incorporation of current literature article and drugs undergoing clinical trials.

Prerequisites: This course is designed for students who have taken Biochemistry I (CHEM 4411).


Web Resources: The Brightspace D2L online course management system will be used to post announcements, lecture notes, problem sets, and answer keys to class activities. It can be accessed through the D2L link on the left side of your “myBSU” webpage. Please check this course site frequently as it will be the primary form of electronic communication. Also, use and check your BSU email.

Key points about this course:
- We will cover a lot of material spanning several disciplines. It is important to not fall behind in this course as the material builds on previous information. In other words, concepts learned in the first weeks of class will be used throughout the entire course.
- Success will require reading the text, studying course notes, and completing the selected problems.
- Some topics will be discussed in more detail than others, so please pay attention in class and to the assigned sections of the text.
- The field of medicinal chemistry contains many drug names and scientific/medical terminology, and we will not discuss it all. Don’t get overwhelmed by the jargon when reading.
Course Goals and Learning Outcomes

The overall goals of this course are to:

- Understand how drugs are designed to interact with specific targets.
- Explain how drugs interfere with biochemical processes.
- Improve oral and written communication.

By the end of this course, students will be able to:

- Identify and diagram covalent and non-covalent interactions within proteins and nucleic acids, and those between biomolecules and drugs.
- Classify the main biological targets of drugs and provide examples of how they interact with their targets.
- Recognize different types of enzyme inhibitors, diagram enzyme inhibitor mechanisms, and explain how enzyme activity is regulated.
- Investigate the structural and functional types of receptors and the types of molecules (agonists vs. antagonists) that bind receptors, as well as relate the binding of molecules to receptors to downstream signaling effects.
- Differentiate the methods that drugs use to bind nucleic acid targets.
- Examine and summarize the common modes of action of antibacterials, antivirals, anticancer compounds, drugs that affect the peripheral or central nervous system, and opioids.

CLASSWORK and EXAMS

Group Activities, Problem Sets, and Case Studies: In class activities will allow you to apply the concepts discussed in lecture. Approximately one class period per week will take the form of problem sets, case studies, online activities, or literature reviews. You are encouraged to work together. Some activities will be graded individually, and others will receive a group grade. Your total activity points throughout the semester will be applied to your final grade. A maximum of 195 points can count towards your grade, but throughout the semester more points will be offered. In other words, you don’t need to get every question right in order to get the full number of points. There will be no opportunities to makeup missed activities.

Problem Sets: A list of problems will be provided for you to apply the material discussed in class. Although these will not be collected or graded, you should strive to work as many of the problems as possible to improve their understanding of course material. Also, related problems (or possibly identical ones!) may appear on exams. You are encouraged to discuss them with peers and the instructor.

Drug Action Project: Each student will research a specific drug target that falls into one of the chapters covered in Part II of the course. Students will vote and select 4 of the following chapters:
- Ch 19: Antibacterial Agents
- Ch 20: Antiviral Agents
- Ch 21: Anticancer Agents
- Ch 22: Cholinergerics – altering acetylcholine signaling
- Ch 23: Adrenergics – altering adrenaline and noradrenaline signaling
- Ch 24: Opioid analgesics
- Ch 25: Anti-ulcer agents – altering histamine signaling and proton pump inhibitors

The topic of the Drug Action Project should align with 1 of the selected chapters. Students will prepare a presentation (15 min) and a paper (7-10 pages). More details on the project will be provided.

Students taking this course at the graduate level are expected to focus on 2 or more different treatment modes for one condition. The work will culminate in a presentation (30 min) and paper (10-12 pages) and must incorporate data from the literature.
Attendance: Regular attendance and paying attention in class is essential for success in this course. Even though attendance is not formally incorporated into the course grade, many group activities completed during the class period will be graded. It is the student’s responsibility to obtain course materials such as notes, hand-outs, and electronic devices, such as cell phones, ipods, etc., will not be allowed. No extra time will be granted to latecomers, so BE ON TIME!

Exams: Exams will be based on material discussed in class, the assigned readings, class activities, and problem sets. Questions will primarily short answer with some multiple choice, matching, and fill in the blank. Students taking the graduate level course will have to answer 1 additional exam question on each exam. Notes, textbooks, and electronic devices, such as cell phones, ipods, etc., will not be allowed. No extra time will be granted to latecomers, so BE ON TIME!

The final exam will contain material from the selected chapters (Ch 19- Ch 25) and student presentations.

Exam Point Recapture: Exams test your understanding, but can also help you learn. To “recapture” points lost on a unit exam, submit a written summary within one (1) week of receiving the exam grade that includes:
1. The full exam question and number.
2. Why your answer was incorrect.
3. The correct answer supported by either a citation from your notes or text that helped you determine the correct answer or the “work” or calculations you used to solve the problem.
Adequate written responses will allow you to regain 50% of the lost points (If you answered a 10 point question incorrectly, you can “recapture” 5 points.) A maximum of 10 points can be added to any unit exam, so you have the opportunity to raise your score by one letter grade.

GRADES and OTHER GRADE ISSUES

Grades: The grade for this course includes exams, class activities, a written paper, a presentation, and providing feedback to classmates on their presentations. Grades will be assigned based on the percent of total points earned. The grading scale may be adjusted so the class average is at (or above) the C grade; the brackets will only be lowered, never raised, meaning a 90% will always earn an A. The final paper and presentation must be completed to pass the course.

<table>
<thead>
<tr>
<th>Component</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams</td>
<td>300</td>
</tr>
<tr>
<td>Topic Selection, 25 pts</td>
<td></td>
</tr>
<tr>
<td>Detailed outline, 25 pts</td>
<td></td>
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<tr>
<td>Paper, 100 pts</td>
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<tr>
<td>Presentation, 75 pts</td>
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<tr>
<td>(maximum of 195 pts total out of 225 pts, 9 x 25 pts)</td>
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</tr>
<tr>
<td>Project</td>
<td>225</td>
</tr>
<tr>
<td>Detailed outline, 25 pts</td>
<td></td>
</tr>
<tr>
<td>Paper, 100 pts</td>
<td></td>
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<tr>
<td>Presentation, 75 pts</td>
<td></td>
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<tr>
<td>(maximum of 195 pts total out of 225 pts, 9 x 25 pts)</td>
<td></td>
</tr>
<tr>
<td>Class Activities</td>
<td>195</td>
</tr>
<tr>
<td>Peer Feedback</td>
<td>30</td>
</tr>
<tr>
<td>3 x 10 pts each</td>
<td></td>
</tr>
</tbody>
</table>

Please double check that the correct grades are entered into the on-line grading system. If a grade is improperly entered, notify me – within two weeks of the error – and I can make the appropriate change. Please keep all graded work that is returned to you in a file so grades can be double checked if needed.

Extra Credit: There will not be extra credit in this class. Please use your time working on the material, readings and problems. If your grade is not meeting your goal, please come talk to me so I can offer some strategies to help you succeed at learning the material.
EXPECTATIONS and HELP

Instructor Roles
As your instructor, I will:
- Treat you with respect and create an environment where everyone is comfortable.
- Organize lectures and activities that help you learn the course material.
- Provide feedback on your progress, and accept feedback on my performance.
- Be open to student suggestions and ideas.

Student Roles
As a student in this class you are expected to:
- Respect your classmates and instructor by treating everyone fairly, participating in group activities, and not distracting others from learning.
- Check your university email and D2L for announcements and updates.
- Know and follow course procedures.
- Be prepared for class and have work completed on time.
- Reduce the following distractions:
  - Coming to class late or leaving early.
  - Ringing cell phones. Please turn phones off or to silent.
  - Texting or browsing the internet.
  - Intimidating or aggressive behavior.
  - Talking with neighbors and off-task behavior.

The environment of our classroom should promote the academic achievement of all members. Students whose behavior is disruptive to the learning environment will be asked to leave. The full student conduct code is available here: [http://www.bemidjistate.edu/students/handbook/](http://www.bemidjistate.edu/students/handbook/)

Credits and Workload: Learning takes time and hard work. For undergraduate courses, one credit is defined as equivalent to an average (over the semester) to three hours of learning effort per week for an average student to achieve an average grade. Thus, for this course, a student with an average level of preparation should expect to spend an additional 6 hours a week on course work outside of the classroom to achieve a passing grade.

To be Successful in this Course:
- Read the material before class and review notes after lecture, but don’t try to memorize everything.
- Prepare for the activity sessions; treat them like group exams.
- Do the suggested homework problems.
- Study for exams. At a minimum, review your notes, course activities and homework problems. Determine common themes between all course activities.
- Get additional help from the instructor if needed. Ask the Instructor! If you need help with the course material, come see me! I am willing to answer questions on course content, provide feedback on assignments, review problems, and devise study plans…or just chat.

Other Resources:
- The textbook’s online resource center ([http://global.oup.com/uk/orc/chemistry/patrick5e/](http://global.oup.com/uk/orc/chemistry/patrick5e/)) provides multiple choice questions for each chapter and additional student resources such as rotatable structures.
- In my office, I have a small collection of medicinal chemistry and biochemistry textbooks. You can have access to them while you are on campus.
- There are also many online sources with great information:
  - Drug databank (chemical, pharmacological and drug target information) [http://www.drugbank.ca/](http://www.drugbank.ca/)
  - Food and drug administration, [http://www.fda.gov/](http://www.fda.gov/)
  - Physician’s Desk Reference, [http://www.pdr.net/](http://www.pdr.net/)
COURSE POLICIES

Late Work Policy: Assignments are expected to be completed on time. Every day the work is handed in late the total score will be decreased by 5% (meaning a maximum score of 95% is possible when 1 day late, 90% when 2 days late, etc.) up to 7 days. After, 1 week the assignment will receive zero.

Excused Absences (Make-up Policy): You may be excused due to jury duty, military service, participation in BSU athletics, other BSU sponsored activities, illness, death in the family, or other excused absences only if: 1) the instructor is notified (see below), and 2) the required documentation is provided. When at all possible notify the instructor one week in advance (email several hours before class if you are sick); notification should not be later than within 24 hours of an excused absence. Excused absences due to illness may require a doctor's note and a death in the immediate family can be verified by an obituary. If a course activity is missed due to an excused absence and documentation is provided, an opportunity for a make-up will be given. An unexcused absence will result in a score of zero for a missed exam or presentation.

Re-Grade Policy: If you do not understand how a particular question of assignment was graded, you may talk to me about it. Re-grade requests are intended to correct grading errors, not for negotiating a higher grade. When work is submitted for re-grade, the entire work may be re-graded.

Please follow these instructions, if you honestly believe a grade should be reconsidered:
1. Wait at least 24 hour after receiving the grade, but no more than one week.
2. Submit to me your original graded exam or assignment and a written explanation containing specific rationale for why your answer is correct or why you believe your work deserves a higher grade. (“I think I deserve a better grade” is not a valid rationale.)

Academic Integrity Statement: BSU students are expected to practice the highest standards of ethics, honesty and integrity in all of their academic work. Any form of academic dishonesty may result in disciplinary action. Possible disciplinary actions may include failure for part of all of a course as well as suspension from the University.

Academic dishonesty includes plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering forgiving, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. The full BSU Academic Integrity Policy can be found at http://www.bemidjistate.edu/offices/president/policies/category/

Please ask if you have any questions about the expectations of an assignment or exam.

Disability Services: Upon request students with a documented disability may receive appropriate and reasonable accommodations in this course including information in an alternate format. Please contact the Disability Services Office at 755-3883 or email disabilityservices@bemidjistate.edu.

Student Mental Health and Stress Management: As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. At BSU, the Student
Center for Health and Counseling (755-2053) is available to assist you with concerns. You can learn more about the broad range of mental health services available on campus at http://www.bemidjistate.edu/students/services/health_counseling/.

**COURSE SCHEDULE**
The following outline of course topics is subject to change. Any modifications will be announced in class.

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Readings</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 11</td>
<td>Syllabus and Lab Introduction</td>
<td></td>
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<tr>
<td></td>
<td>Jan 13</td>
<td>Drugs and drug targets, intermolecular forces</td>
<td>Ch. 1</td>
</tr>
<tr>
<td></td>
<td>Jan 15</td>
<td>ACTIVITY</td>
<td></td>
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<tr>
<td>2</td>
<td>Jan 18</td>
<td>No class – MLK Jr. day</td>
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<tr>
<td></td>
<td>Jan 20</td>
<td>Amino acids; Functions of proteins</td>
<td>Ch 1.1, 2.7</td>
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<tr>
<td></td>
<td>Jan 22</td>
<td>Protein structure</td>
<td>Ch 2.2 – 2.4</td>
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<tr>
<td>3</td>
<td>Jan 25</td>
<td>Enzymes: active sites, substrate binding, and catalysis, regulation, and isozymes</td>
<td>Ch 3.1 – 3.7</td>
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<td></td>
<td>Jan 27</td>
<td>ACTIVITY</td>
<td></td>
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<tr>
<td></td>
<td>Jan 29</td>
<td>Enzyme inhibitors</td>
<td>Ch 7.1 – 7.7</td>
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<tr>
<td>4</td>
<td>Feb 1</td>
<td>Enzyme Kinetics</td>
<td>Ch 3.8 (Stevens 4.3)</td>
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<tr>
<td></td>
<td>Feb 3</td>
<td>Inhibitor Kinetics, Ki and IC50</td>
<td>Ch 7.8 (Stevens 4.4 – 4.5)</td>
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<tr>
<td></td>
<td>Feb 5</td>
<td>ACTIVITY</td>
<td></td>
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<tr>
<td>5</td>
<td>Feb 8</td>
<td>EXAM 1</td>
<td></td>
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<tr>
<td></td>
<td>Feb 10</td>
<td>Intro to Part II of the course Receptors: roles, types, activation</td>
<td>Ch 4.1 – 4.5</td>
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<tr>
<td></td>
<td>Feb 12</td>
<td>Ion channels</td>
<td>Ch 4.6</td>
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<tr>
<td>6</td>
<td>Feb 15</td>
<td>No Class – In-service day</td>
<td></td>
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<tr>
<td></td>
<td>Feb 17</td>
<td>G-protein coupled receptors</td>
<td>Ch 4.7</td>
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<td></td>
<td>Feb 19</td>
<td>Signal transduction w/ GPCRs and adeny late cyclase and phospholipase C</td>
<td>Ch 5.1 – 5.3</td>
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<tr>
<td>7</td>
<td>Feb 22</td>
<td>ACTIVITY</td>
<td></td>
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<tr>
<td></td>
<td>Feb 24</td>
<td>Receptors as drug targets Types of ligands</td>
<td>Ch 8.1 – 8.4, 8.5 (Stevens 5.3)</td>
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<tr>
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<td>Feb 26</td>
<td>Sensitization, tolerance, affinity, efficacy, potency</td>
<td>Ch 8.6, 8.7, 8.9 Survey – Vote on Chapters for Part II</td>
</tr>
<tr>
<td>8</td>
<td>Feb 29</td>
<td>ACTIVITY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mar 2</td>
<td>Nucleic acid structure</td>
<td>Ch 6.1 – 6.1.3, 6.2.1</td>
</tr>
<tr>
<td></td>
<td>Mar 4</td>
<td>Nucleic acid drugs: intercalate, alkylate, chain terminate</td>
<td>Ch 9.1, 9.3, 9.5 Topic Selections Due (for Part II)</td>
</tr>
<tr>
<td>9</td>
<td>Mar 7</td>
<td>Nucleic acid drugs - examples</td>
<td></td>
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<tr>
<td></td>
<td>Mar 9</td>
<td>ACTIVITY</td>
<td></td>
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<tr>
<td></td>
<td>Mar 11</td>
<td>EXAM 2</td>
<td></td>
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<tr>
<td></td>
<td>Mar 14-18</td>
<td>Spring Break</td>
<td></td>
</tr>
</tbody>
</table>

(Please note the day of this exam and plan travels appropriately.)
### Week 10
- **Mar 21**
  - **M**
  - **Ch 19:** Antibacterial Agents, antimetabolites, and cell membrane agents
  - **Readings:** 19.2-19.4 and 19.6
  - **Due:** 19.2-19.4 and 19.6

- **Mar 23**
  - **W**
  - **Ch 19:** Antibacterial agents that inhibit cell wall synthesis
  - **Readings:** 19.5
  - **Due:** 19.5, **Ch 19 Detailed outlines**

- **Mar 25**
  - **F**
  - **ACTIVITY**

### Week 11
- **Mar 28**
  - **M**
  - **Antibacterial (& antiviral) presentations:**
    - Tetracyclines
    - Chain terminators

- **Mar 30**
  - **W**
  - **Ch 20:** DNA and RNA viruses- structure, life cycle, and antivirals
  - **Readings:** 20.1-20.5, 20.7.1, & 20.8.1
  - **Due:** 20.1-20.5, 20.7.1, & 20.8.1, **Ch 20 Detailed outlines**

### Week 12
- **April 1**
  - **F**
  - **Ch 20:** HIV Protease inhibitors
  - **Readings:** 20.7.4
  - **Due:** 20.7.4, **Ch 19 Papers**

- **April 4**
  - **M**
  - **Ch 20:** Antivirals for cold virus and hepatitis C
  - **Readings:** 20.9 and 20.10
  - **Due:** 20.9 and 20.10, **Ch 19 Papers**

### Week 13
- **April 6**
  - **W**
  - **ACTIVITY**

### Week 14
- **April 8**
  - **F**
  - **Antiviral Presentations:**
    - HIV integrase inhibitors
    - Anti-virals for the flu
    - Neuroamidase inhibitors and virus attachment

- **April 11**
  - **M**
  - **Ch 21: Cancer Intro**
  - **Readings:** 21.1

- **April 13**
  - **W**
  - **Ch. 21: Anticancer agents acting on enzymes or structural proteins**
  - **Readings:** 21.3, 21.5, and 21.7 (maybe)

### Week 15
- **April 15**
  - **F**
  - **ACTIVITY**

### Week 16
- **April 18**
  - **M**
  - **Anticancer presentations:**
    - Photodynamic therapy
    - Tyrosine Kinase Inhibitors for non-small lung cancer
    - Hyperactive B-Raf mutations, search for inhibitors

- **April 20**
  - **W**
  - **Ch. 24:** Morphine structure, properties, target, PD and PK
  - **Readings:** 24.1-24.5

- **April 22**
  - **F**
  - **Ch. 24:** Morphine analogues, agonists, and antagonists
  - **Readings:** 24.6-24.7, 24.9.1

### Week 17
- **April 25**
  - **M**
  - **ACTIVITY**

### Week 18
- **April 27**
  - **W**
  - **Opioid Presentations:**
    - Dermorphins, peptide-based analgesics
    - Peptidase inhibitors
    - Enkephalin delivery through the blood brain barrier

- **May 4**
  - **W**
  - **No class (final exam week)**

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Part II of the course will briefly cover 4 of the following chapters (as selected by the students):

- Ch 19: Antibacterial Agents
- Ch 20: Antiviral Agents
- Ch 21: Anticancer Agents
- Ch 22: Chloinergics – altering acetylcholine signaling
- Ch 23: Adrenergics – altering adrenaline and noradrenaline signaling
- Ch 24: Opioid analgesics
- Ch 25: Anti-ulcer agents – altering histamine signaling and proton pump inhibitors
BSU Curriculum Forms

Form 3
Updated: 9.19.15

New Course Form

Course Number:
Undergraduate: CHEM 4894
Graduate: n/a

Course Title: Research I

Course Description:
This research experience in chemistry will develop essential skills needed to be a chemist. Student researchers will formulate questions, utilize concepts and techniques learned in the classroom, and analyze arguments. Presentations and papers will communicate findings. Prerequisite(s): Junior status and consent of instructor.

Credits: 2 cr

Prerequisite(s):
Undergraduate: Junior status and consent of instructor.
Graduate: n/a

1. Reason(s) for creating this course:
The purpose of this course is to provide students majoring in biochemistry, cellular, and molecular biology (BCMB) or chemistry (CHEM) a yearlong research experience. Involvement in research projects prepares students to enter the job market and is a key component to successful graduate and professional school applications. Additionally, the creation of a research-based course in chemistry will give students research options, outside the biology department, to complete the BCMB degree.

2. How often will this course be offered?
Once every academic year, in fall

3. What are the student learning outcomes for the course (please precede each outcome with "Students will...")?
- Students will develop laboratory skills which may include solution preparation, pipetting, organic synthesis, and spectroscopic analysis.
- Students will practice standard operating procedures, including lab safety, and safely use, handle, and store chemicals and hazardous waste.
- Students will record experimental methods and results in a laboratory notebooks.
- Students will interpret data to characterize synthetic products, evaluate purity, and evaluate the response to analytes.
Students will evaluate primary literature articles that are relevant to the research project and use them to guide project and place results in the context of the field.

Students will summarize and explain experimental results in written and oral reports.

Students will write a research progress report that models a scholarly paper and includes relevant background information, materials and methods, results and discussion, and supporting references.

4. What are the major content areas for the course?

   **Research methods are the main content for this course, which involves:**
   - Use of scientific practices: Ask questions, propose hypotheses, design studies, select methods, analyze data, develop and critique arguments, and communicate findings.
   - Discovery: Obtain new knowledge and insights and perform studies with unknown results.
   - Relevant and important work: Contribute to current science knowledge, impact extends beyond class, and present and/or publish work.
   - Collaboration: Work in a team, contribute special skills, interact with classmates and faculty, and communicate.
   - Iteration: Repeat and revise previous experiments.

5. Is this course repeatable for credit, and if so, what is the maximum number of credits that can be earned?

   No

6. If this course is intended primarily for off-campus delivery (not offered on campus), what delivery mechanism will be used?

   This course is intended for on-campus delivery.

7. What is the projected maximum class size (cap)?

   10 students

8. What qualified faculty will be available to teach this course?

   Dr. Katie Peterson is qualified to teach this course and has taught a research-based medicinal chemistry laboratory Fall 2014-Spring 2017 semesters. Her interdisciplinary thesis research, completed at the University of Minnesota, involved the detection of small molecule analytes via fluorescence and required organic synthesis, bioanalytical analysis, and cell assays. As such, her current research interests build on her expertise and prior experiences. Additionally, Dr. Peterson has mentored 12 undergraduate students in upper division research-based laboratory courses. Students have advanced these research projects; their work has culminated in poster presentations at local, regional, and national conferences. Past research mentees have successfully applied to graduate and professional schools. It is worth noting that the phosphate project is performed in collaboration with Dr. Valerie Pierre at the UMN, which provides BSU students opportunities to interact with graduate students and potentially perform research on the UMN campus.
NOTE WELL: Department and dean, in approving this proposal, attest both to the adequacy of the qualifications of faculty here named, and to their availability to teach the course at the frequency specified above, without excessive overload or disruption to other curriculum.

9. What additional library and other resources need or should be provided for this course, that are not already available? none

10. What special personal property or service fee(s) would be charged to students taking this course? These charges would be for 1) items that are retained by the student and have an educational or personal value beyond the classroom, or 2) services that are on the student’s behalf (see MnSCU Board Policy 5.11).
   Amount per student: $15 per credit
   For: Equivalent to the current laboratory fees for upper division chemistry courses.

11. Attach a sample syllabus for the course. Note: if this course is double-numbered (ugrad/grad), the syllabus must include an additional component for graduate students.

NOTE:
The syllabus for CHEM 4894 is combined with the syllabus for CHEM 4895. Therefore, it has been placed after CHEM 4895.
BSU Curriculum Forms

New Course Form

Course Number:
  Undergraduate: CHEM 4895
  Graduate: n/a

Course Title: Research II

Course Description:
This second course in a two course research sequence in chemistry will continue to develop essential skills needed to be a chemist. Student researchers will formulate questions, utilize concepts and techniques learned in the classroom, and analyze arguments. Presentations and papers will communicate findings. Prerequisite(s): CHEM 4894, Junior status and consent of instructor.

Credits: 2 cr

Prerequisite(s):
  Undergraduate: CHEM 4894, Junior status and consent of instructor
  Graduate: n/a

1. Reason(s) for creating this course:
The purpose of this course is to provide students majoring in biochemistry, cellular, and molecular biology (BCMB) or chemistry (CHEM) a yearlong research experience. Involvement in research projects prepares students to enter the job market and is a key component to successful graduate and professional school applications. Additionally, the creation of a research-based course in chemistry will give students research options, outside the biology department, to complete the BCMB degree.

2. How often will this course be offered?
  Once every academic year, in spring

3. What are the student learning outcomes for the course (please precede each outcome with “Students will...”)?
   - Students will develop laboratory skills which may include solution preparation, pipetting, organic synthesis, and spectroscopic analysis.
   - Students will practice standard operating procedures, including lab safety, and safely use, handle, and store chemicals and hazardous waste.
   - Students will record experimental methods and results in a laboratory notebooks.
   - Students will interpret data to characterize synthetic products, evaluate purity, and evaluate the response to analytes.
• Students will evaluate primary literature articles that are relevant to the research project and use them to guide project and place results in the context of the field.
• Students will summarize and explain experimental results in written and oral reports.
• Students will write a research progress report that models a scholarly paper and includes relevant background information, materials and methods, results and discussion, and supporting references.

4. What are the major content areas for the course?
   Research methods are the main content for this course, which involves:
   • Use of scientific practices: Ask questions, propose hypotheses, design studies, select methods, analyze data, develop and critique arguments, and communicate findings.
   • Discovery: Obtain new knowledge and insights and perform studies with unknown results.
   • Relevant and important work: Contribute to current science knowledge, impact extends beyond class, and present and/or publish work.
   • Collaboration: Work in a team, contribute special skills, interact with classmates and faculty, and communicate.
   • Iteration: Repeat and revise previous experiments.

5. Is this course repeatable for credit, and if so, what is the maximum number of credits that can be earned?
   No

6. If this course is intended primarily for off-campus delivery (not offered on campus), what delivery mechanism will be used?
   This course is intended for on-campus delivery.

7. What is the projected maximum class size (cap)?
   10 students

8. What qualified faculty will be available to teach this course?
   Dr. Katie Peterson is qualified to teach this course and has taught a research-based medicinal chemistry laboratory Fall 2014-Spring 2017 semesters. Her interdisciplinary thesis research, completed at the University of Minnesota, involved the detection of small molecule analytes via fluorescence and required organic synthesis, bioanalytical analysis, and cell assays. As such, her current research interests build on her expertise and prior experiences. Additionally, Dr. Peterson has mentored 12 undergraduate students in upper division research-based laboratory courses. Students have advanced these research projects; their work has culminated in poster presentations at local, regional, and national conferences. Past research mentees have successfully applied to graduate and professional schools. It is worth noting that the phosphate project is performed in collaboration with Dr. Valerie Pierre at the UMN, which provides BSU students opportunities to interact with graduate students and potentially perform research on the UMN campus.
NOTE WELL: Department and dean, in approving this proposal, attest both to the adequacy of the qualifications of faculty here named, and to their availability to teach the course at the frequency specified above, without excessive overload or disruption to other curriculum.

9. What additional library and other resources need or should be provided for this course, that are not already available? none

10. What special personal property or service fee(s) would be charged to students taking this course? These charges would be for 1) items that are retained by the student and have an educational or personal value beyond the classroom, or 2) services that are on the student’s behalf (see MnSCU Board Policy 5.11).
   Amount per student: $15 per credit
   For: Equivalent to the current laboratory fees for upper division chemistry courses.

11. Attach a sample syllabus for the course. Note: if this course is double-numbered (u-grad/grad), the syllabus must include an additional component for graduate students.
BACKGROUND

Over the course of TWO semesters (fall and spring), you will participate in research in one of the following areas:

- Fluorescent detection of hydrogen sulfide
- Metal complexes for the catch-and-release of phosphates

Through this research experience you will develop essential skills needed to be a chemist and work semi-independently. Research is both rewarding and an exciting challenge. In the research laboratory, you will formulate questions, utilize concepts and techniques learned in the classroom, and analyze arguments. Students that participate in research projects that make significant progress over the course of the year can present their findings at a regional scientific meetings.

Course Descriptions:

CHEM 4894 Research I: This research experience in chemistry will develop essential skills needed to be a chemist. Student researchers will formulate questions, utilize concepts and techniques learned in the classroom, and analyze arguments. Presentations and papers will communicate findings. Prerequisite(s): Junior status and consent of instructor.

CHEM 4895 Research II: This second course in a two course research sequence in chemistry will continue to develop essential skills needed to be a chemist. Student researchers will formulate questions, utilize concepts and techniques learned in the classroom, and analyze arguments. Presentations and papers will communicate findings. Prerequisite(s): CHEM 4894, Junior status and consent of instructor.

Required Materials:

- Laboratory Notebook, bound (composition-style) notebook. Only for this class; you must turn it in at the end of the term.
- Safety Goggles with side-splash protection.
- Calculator. Please don’t use an expensive graphing calculator.

LEARNING OUTCOMES

Through this course, students will:

- Develop laboratory skills which may include solution preparation, pipetting, organic synthesis, and spectroscopic analysis.
- Practice standard operating procedures, including lab safety. Safely use, handle, and store chemicals and hazardous waste.
- Record experimental methods and results in a laboratory notebook.
- Interpret data to characterize synthetic products, evaluate purity, and evaluate the response to analytes.
- Evaluate primary literature articles that are relevant to the research project; use literature to guide project and place results in the context of the field.
- Summarize and explain experimental results in written and oral reports.
- Write a research progress report that models a scholarly paper and includes relevant background information, materials and methods, results and discussion, and supporting references.
CLASSWORK

Laboratory Research: You will be participating in course-based undergraduate research (CURE), which involves:

- **Use of scientific practices**
  - Ask questions, propose hypotheses, design studies, select methods, analyze data, develop and critique arguments, communicate findings.

- **Discovery**
  - Obtain new knowledge and insights.
  - Perform studies with unknown results.

- **Relevant and important work**
  - Contribute to current science knowledge.

- **Collaboration**
  - Work in a team: contribute special skills.
  - Interact with classmates and faculty.
  - Communicate.

- **Iteration**
  - Repeat and revise previous experiments.

- **Impact extends beyond class.**
  - Present and/or publish work.

Attendance and Participation: To fulfill the course requirements, you must work a minimum of 4 hours per week in the laboratory. In fact, you will likely work more than that in the lab. Additionally, you will meet with the instructor weekly or bi-weekly to discuss findings and develop new experiments. I encourage you to set aside at least 6 hours a week for this course so that your project will progress. The more time and effort you put into this course and your research project, the more enjoyable and meaningful your undergraduate research experience will become.

You must attend scheduled lab meetings, literature reviews, and lab times. Attendance and participation are incorporated into your grade.

- Four or more unexcused absences from lab or lab lecture meetings will result in a failing grade.
- Earning participation points requires commenting on the articles, asking questions, and assisting other student researchers in problem solving.

As your instructor, I will help guide you through the research process, aid in experimental design, discuss data, and collaborate to draw key conclusions. Most of your work, however, will be performed semi-independently. You will need to be motivated to enable the progression of your project. Research projects do not always go as expected!

Please come a talk to me whenever you have questions, need help finding information, or are unsure of how to set up an experiment or use an instrument.

**Lab Notebooks:** Purchase a new notebook just for this course. You will use your laboratory notebook to record your methods, collected data, and conclusions. This book is a complete record of your work! The notebook should be **bound** (not spiral), and entries should be written in ink. If you make a mistake, just draw a line through the error then correct it (ex. $2 + 3 = 6$, $2 + 3 = 5$). Don’t worry about mistakes - they happen. Lab notebooks should be organized and legible, but are not always neat. **Lab notebooks will be graded periodically and must be submitted at the end of the term.**

See the SOP on Lab Notebooks for specifics.

**Research Updates:** These will take the form of written reports that include methods, experimental data, figures, and a discussion of your results. This process allows you to summarize your accomplishments and think about the trajectory of your project. More information on format and expectations will be provided.
**Literature Discussions:** Reading primary literature helps guide experimental design and places results in context of current progress in the field. You will be responsible for finding, reading, and sharing literature articles with your classmates. Specific assignments include annotated bibliographies and literature presentations. The goals are to 1) link your results to those presented in the literature, 2) build a list of references for your final paper, and 3) stimulate discussion among class members.

**Final Research Paper (Fall and Spring):** You will use the information compiled in your research updates to prepare a final research report that summarizes your entire project. The format of the report follow that of a research article and includes an introduction, methods, results and discussion, conclusion, and references. A guide on how to write and format reports, a grading rubric, and example reports are available for review.

**Research Presentation (Fall):** You will summarize your semester progress in a presentation (~15 min) to the class that includes background information, methods, results and discussion. Email a copy of your presentation to the instructor.

**Presentation at the Student Achievement Conference (Spring):** You will also present the results of your research project at the Student Achievement Conference in Spring semester. A how to guide for creating posters is available.

**GRADES AND OTHER GRADE ISSUES**

**Grades:** The grade for this course includes the items in the categories below based on the percent of total points earned. **You must present your research and submit a final research report along with your laboratory notebook and any data or characterization records!** Not fulfilling these requirements will result in an “I” grade.

<table>
<thead>
<tr>
<th>Component</th>
<th>Percent Earned</th>
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<tbody>
<tr>
<td>Laboratory Safety Practices</td>
<td>25</td>
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<tr>
<td>Attendance / Time in Lab</td>
<td></td>
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<tr>
<td>≤ 1 absence, 35 pts</td>
<td>35</td>
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<tr>
<td>2 absences, 25 pts</td>
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<tr>
<td>3 absences, 15 pts</td>
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<tr>
<td>≥ 4 absences, 0 pts fail</td>
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<tr>
<td>Participation during lab meetings</td>
<td>40</td>
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<tr>
<td>Based on student comments and suggestions during literature discussions and research updates.</td>
<td>50</td>
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<tr>
<td>Lab work (subjective)</td>
<td>2 x 40 pts each</td>
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<tr>
<td>Notebook and Data Checks</td>
<td>40</td>
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<tr>
<td>4 x 10 pts each</td>
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<tr>
<td>Research Updates (group)</td>
<td>80</td>
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<tr>
<td>2 x 40 pts each</td>
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<tr>
<td>Final Paper (individual)</td>
<td>120</td>
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<td>Detailed outline, 20 pts</td>
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<tr>
<td>Paper, 100 pts</td>
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<tr>
<td>Presentation</td>
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<tr>
<td>• Fall: Literature and Research Presentation (group)</td>
<td>60</td>
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<tr>
<td>Fall: Literature, 20 pts</td>
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<tr>
<td>Research, 40 pts</td>
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<td>• Spring: Student Achievement Conference (group)</td>
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<td>Spring: Abstract, 10 pts</td>
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<tr>
<td>Presentation, 50 pts</td>
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<table>
<thead>
<tr>
<th>Grade</th>
<th>Percent Earned</th>
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<tbody>
<tr>
<td>A (excellent)</td>
<td>90 - 100 %</td>
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<tr>
<td>B (above average)</td>
<td>80 - 90 %</td>
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<tr>
<td>C (average)</td>
<td>70 - 80%</td>
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<tr>
<td>D (unsatisfactory)</td>
<td>60 - 70%</td>
</tr>
<tr>
<td>F (failing)</td>
<td>0 - 59%</td>
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</tbody>
</table>

Please double check that the correct grades are entered into the on-line grading system. If a grade is improperly entered, notify me – within two weeks of the error – and I can make the appropriate change. Please keep all graded work that is returned to you so grades can be double checked if needed.
COURSE POLICIES

**Late Work Policy:** Assignments are expected to be completed on time. Every day the work is handed in late the total score will be decreased by 5% (meaning a maximum score of 95% is possible when 1 day late, 90% when 2 days late, etc.) up to 7 days. After, 1 week the assignment will receive zero.

**Excused Absences:** You may be excused due to jury duty, military service, participation in BSU athletics, other BSU sponsored activities, illness, death in the family, or other excused absences only if: 1) the instructor is notified (see below), and 2) the required documentation is provided. When at all possible notify the instructor *one week in advance* (email several hours before class if you are sick); notification should not be later than within 24 hours of an excused absence. Excused absences due to illness may require a doctor's note and a death in the immediate family can be verified by an obituary. If a course activity is missed due to an excused absence and documentation is provided, an opportunity for a make-up will be given. An unexcused absence will result in a score of zero.

**Disability Services:** Upon request students with a documented disability may receive appropriate and reasonable accommodations in this course including information in an alternate format. Please contact the Disability Services Office at 755-3883 or email disabilityservices@bemidjistate.edu.

**Academic Integrity:** BSU students are expected to practice the highest standards of ethics, honesty and integrity in all of their academic work. Any form of academic dishonesty may result in disciplinary actions including failure for part of all of a course as well as suspension from the University.

Academic dishonesty includes plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. The full BSU Academic Integrity Policy can be found at http://www.bemidjistate.edu/offices/president/policies/category/

Please ask if you have any questions about the expectations of an assignment or exam.

**Student Mental Health and Stress Management:** As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. At BSU, the Student Center for Health and Counseling (755-2053) is available to assist you with concerns. You can learn more about the broad range of mental health services available on campus at http://www.bemidjistate.edu/students/services/health_counseling/
LAB RULES AND SAFETY PROCEDURES

Prior to performing laboratory experiments, you are required to attend the safety orientation the first week of lab and read the BSU Chemistry Laboratory Safety Orientation document (handout and on D2L).

Obey the safety rules! Failure to follow safety rules will result in dismissal from the lab.

General Safety Rules:

1. Attire and chemical hygiene. You will be asked to leave if you are not properly dressed for lab.
   a. Wear proper clothing that protects your skin. Unacceptable clothing includes: sleeveless or low cut tops, pants that are ripped or have holes, capri pants or shorts, open-toed, open-heeled shoes, or shoes that do not cover the top of the foot (sandals, ballet flats). No long or loose clothing (i.e. scarves) should be worn to avoid accidental contact with chemicals or flames, and long hair should be tied back.
   b. Safety goggles are required at all times.
   c. Gloves are required at all times.
   d. Lab coats are available for your use.
   e. Gloves and lab coats should be worn in the lab, not outside of it.

2. Chemical hygiene
   a. Food and drink are not allowed in the lab. If you need a drink or snack, feel free to step out for a few minutes.
   b. Keep your backpack away from chemicals.
   c. Do not let your cell phone encounter chemicals.
      i. Use a calculator that is not on your phone
      ii. Put your phone in a re-sealable plastic bag.
   d. Wash your hands before leaving lab.

3. Keep the lab space clean and tidy. Clean your area before you leave.

4. Do not perform unauthorized experiments. Talk to me about your research plans!

5. Research the protocols and safety hazards before starting an experiment. Think about what could go wrong and how to prevent it.

6. Report any accidents or medical problems to the instructor, even small cuts. If you get chemicals on your skin, use cool water to rinse it off. If you get some in your eyes, use the lab eyewashes to rinse it out, for at least 5 minutes and notify the instructor.

7. Dispose of hazardous waste properly. If you have questions regarding proper disposal of a chemical, just ask.
# COURSE SCHEDULE

## Fall

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Lecture Topic</th>
<th>Assignment Due</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Introduction, syllabus, project overviews</td>
<td>Read syllabus</td>
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<td></td>
<td>BSU safety orientation, project selection</td>
<td>Read BSU safety orientation document</td>
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<tr>
<td>2</td>
<td></td>
<td>Literature discussion</td>
<td>Read articles</td>
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<tr>
<td>3</td>
<td></td>
<td>Discuss research plans</td>
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<td>4</td>
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<tr>
<td>5</td>
<td></td>
<td>Keeping a laboratory notebook</td>
<td>Read articles, plan experiments</td>
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<tr>
<td>6</td>
<td></td>
<td>Literature discussion and presentations</td>
<td>Literature assignment</td>
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<td>7</td>
<td></td>
<td>Writing: methods and discussing results</td>
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<td>8</td>
<td></td>
<td>High quality figures: Figure titles and captions, graphing in Excel</td>
<td>Research update #1</td>
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<tr>
<td>9</td>
<td></td>
<td>Small group meetings</td>
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<tr>
<td>10</td>
<td></td>
<td>Literature discussion and presentations</td>
<td>Literature assignment</td>
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<td>11</td>
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<tr>
<td>12</td>
<td></td>
<td>Writing outlines</td>
<td>Research update #2</td>
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<tr>
<td>13</td>
<td></td>
<td>Research Presentations: Expectations and grading</td>
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<tr>
<td>14</td>
<td></td>
<td>Small group meetings</td>
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<tr>
<td>15</td>
<td></td>
<td>Final research papers: Expectations and grading</td>
<td>Final paper outline</td>
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<tr>
<td>16</td>
<td></td>
<td>Research presentations</td>
<td>Presentation</td>
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<td>Final</td>
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## Spring

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<th>Week</th>
<th>Date</th>
<th>Lecture Topic</th>
<th>Assignment Due</th>
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<tbody>
<tr>
<td>1</td>
<td></td>
<td>Discuss research plans</td>
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<td>2</td>
<td></td>
<td>Small group meetings</td>
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<td>3</td>
<td></td>
<td>Literature discussion and presentations</td>
<td>Literature assignment</td>
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<td>5</td>
<td></td>
<td>Writing an abstract</td>
<td>Research update #1</td>
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<td>6</td>
<td></td>
<td>Small group meetings</td>
<td>Student Achievement Conference Abstract</td>
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<tr>
<td>7</td>
<td></td>
<td>Literature discussion and presentations</td>
<td>Literature assignment</td>
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<td>8</td>
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<tr>
<td>9</td>
<td></td>
<td>Research update #2</td>
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<tr>
<td>10</td>
<td></td>
<td>Designing a research poster</td>
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<tr>
<td>11</td>
<td></td>
<td>Small group meetings</td>
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<td>12</td>
<td></td>
<td>Presenting a research poster</td>
<td>Research poster</td>
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<td>13</td>
<td></td>
<td>Poster review and Practice presentations</td>
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<tr>
<td>14</td>
<td></td>
<td>Small group meetings</td>
<td>Student Achievement Conference Presentation</td>
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<td>15</td>
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<td>Final paper outlines</td>
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<td>16</td>
<td></td>
<td>Peer review of final papers</td>
<td>Final paper draft</td>
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<td></td>
<td>Final</td>
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<td>Finals</td>
<td>Final research paper</td>
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<td></td>
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<td>Notebooks and data</td>
</tr>
</tbody>
</table>
Date: 11/14/2017
To: Katie Peterson
From: Keith A. Marek, Chair, Chemistry Department
Re: BCMB Curriculum Proposal

Katie,

Overall, this proposal looks good overall, and should provide a valuable opportunity for our future students. I am fine with this proposal going forward. I had just a few questions/concerns about how this proposal will affect scheduling in the Department.

1. **Scheduling of labs**: My biggest concern is how the scheduling of lab courses will look when this proposal goes into effect. For the most part, there is a "conservation of courses" with this packet in that there is a lab course removed for every course added. However, the new lab courses are being proposed as two credit courses that meet twice per week. This is adding more meeting times to a schedule that is already stressed. Will it be possible to schedule these multiple meeting times in such a way that they do not conflict with each other and current course offerings by the chemistry and biology departments? What will happen if sections become full and we need to schedule multiple sections of the same course? This proposal would be strengthened if it contained a suggested semester schedule for the two emphases. If this proposal passes, our departments (and potentially others) will need to get together to determine a strategy for developing a common course schedule grid to minimize potential conflicts for students enrolled in this major.

2. **Faculty Workloads**: This item is more of a concern for administration to clarify. Chemistry faculty currently do not receive any workload credit for supervising student research. Will chemistry faculty teaching advanced research courses (CHEM 4894, CHEM 4895) be credited with workload for the courses? If multiple faculty are teaching these courses in a semester, this, along with the two credit labs mentioned in 1, could create some minor issues with scheduling of department offerings.

3. **Enrollment/FTE in Interdisciplinary Courses**: Again, a question for administration to clarify. For the interdisciplinary courses, does the student enrollment/FTE get attributed equally to both departments? If not, how does it get assigned?

Let me know if you have any questions.

Sincerely,

Keith A. Marek, Chair
Department of Chemistry
Bemidji State University.
Date:  11/16/2017

Re: Keith A Marek’s, Chair of Chemistry Department Comments on the BCMB Curriculum Proposal

In response to Dr. Keith Marek’s comments, the proposers have included proposed course schedules for completion of either emphasis of the BCMB degree in 4 years (8 semesters). This chart can be found on pages 12-13.
Program to be modified: Biology B.S. Cellular and Molecular Emphasis

List all proposed change(s):

- Required core of the emphasis will increase by one credit and the required electives will decrease by one credit (no change to total credits required for the emphasis).
- BCMB/BIOL 3074 Molecular Techniques and BCMB/BIOL 3075 Cellular Techniques are added to the required core
- BIOL 3380 Molecular Genetics, BIOL 3580 Immunology, BIOL 3590 Cell Biology are all reduced from 4 to 3 credits.
- BIOL 4449 Gene Expression (4 credits) is added as a potential capstone course.
- BIOL 3260 Medical Physiology is changed to Human Physiology (4 cr)
- Drop BIOL 3755 Medical Microbiology and replace with BIOL4715 Clinical Microbiology (3 cr)
- Drop BIOL 4270 Histology (4 credits)
- Several additional biology courses that are consistent with the aims of the emphasis have been added to the electives section: BIOL 3337 Science Communication (3 credits), BIOL 3338 Science Communication Lab (1 credits), BIOL 3339 Bioethics (3 credits) BIOL 4447 Genomics (3 credits), BIOL 4448 Genomics Lab (2 credits), BIOL 4460 Stem Cells and Regenerative Medicine (3 credits), BIOL 4470 Introduction to Vaccinology (4 credits)

Reason(s) for the change(s):

- Changes are required for consistency with course modifications and changes that are occurring as part of the implementation of a BCMB major.
- Additional courses that have been recently added or are being added to the biology major are included as additional electives.

Note: In order to avoid hidden prerequisites, if a course is being dropped from this program (but not from the entire curriculum), please check for which remaining courses may include this dropped course as a prerequisite. Course prerequisites may be found in the online catalog (http://www.bemidjistate.edu/academics/catalog/). Remedies for hidden prerequisites may be found under Curriculum Forms at (http://www.bemidjistate.edu/faculty_staff/faculty_association/forms/).

Note: If a course from another department/program was either added to or dropped from this program, please notify the chair/coordinator of that course's department/program and indicate the following:
The course's home department/program was notified of the addition or dropping of their course(s) on __________ (date) by _________________ (mail, email, or phone).
Please check one of the items below:

______ No comments were received from other programs or departments within one week of the notification.

______ Comments were received within one week of the notification, and are attached.

Note: If this is a joint program, the signatures of both department chairs (and both deans, if different colleges) must be provided.

Alert: Attach a copy of the current program showing the marked changes. Please copy the current program from the online catalog (http://www.bemidjistate.edu/academics/catalog/) and paste it into Word. Then use either the Track Changes feature under Tools, or the underline and strikethrough Font feature under Format. (Please note that the Track Changes feature may be easily switched on and off by holding down the Ctrl+Shift+E keys.)
Biology, B.S. major

Required Credits: 71

Required GPA: 2.25

I REQUIRED BIOLOGY CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)

II REQUIRED CELLULAR AND MOLECULAR EMPHASIS CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BCMB/BIOL 307 Molecular Techniques (2 credits)
- BCMB/BIOL 307S Cellular Techniques (2 credits)
- BIOL 3380 Molecular Genetics—Theory and Practice: Theory and Practice (4 to 4.3 credits)
- BIOL 3580 Immunology (4 to 4.3 credits)
- BIOL 3590 Cell Biology (4 to 4.3 credits)
- BIOL 3710 Microbiology (4 credits)

III CAPSTONE PROJECT

The Biology capstone project, completed in the senior year, provides a culminating experience that integrates the knowledge and skills learned in previous courses and applies them to a scholarly activity.

The capstone project must be designed or chosen by the student in consultation with a faculty mentor or advisor, who must approve the project before work begins. Students should consult with their faculty mentor or advisor before their senior year commences. All capstone projects will include a written and oral component (except for professional/graduate school entrance exams) year, and provides a culminating culminating culminating experience that integrates the knowledge and skills learned in previous courses and applies them to a scholarly activity.

Required capstone project courses (4 credits total).

SELECT 1 OF THE FOLLOWING OPTIONS:

OPTION 1

- BIOL 4894 Advanced Research Project I (2 credits)
- and BIOL 4895 Advanced Research Project II (2 credits)
OPTION 2

- BIOL 4449 Gene Expression (4 credits)

IV REQUIRED CELLULAR AND MOLECULAR EMPHASIS ELECTIVES

SELECT 8 SEMESTER CREDITS FROM THE FOLLOWING COURSES:

- BIOL 3260 Medical Human Physiology (4 credits)
- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3337 Science Communication (3 credits)
- BIOL 3338 Science Communication Lab (1 credits)
- BIOL 3339 Bioethics (3 credits)
- BIOL 3755 Medical Microbiology (3 credits)
- BIOL 4270 Histology (4 credits)
- BIOL 4360 Developmental and Tumor Biology (4 to 3 credits)
- BIOL 4447 Genomics (3 credits)
- BIOL 4448 Genomics Lab (2 credits)
- BIOL 4460 Stem Cells and Regenerative Medicine (3 credits)
- BIOL 4470 Introduction to Vaccinology (4 credits)
- BIOL 4715 Clinical Microbiology (3 credits)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)

V REQUIRED COURSES IN RELATED FIELDS

A. SELECT 1 OF THE FOLLOWING GROUPS:

GROUP 1:

- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)

GROUP 2:

- CHEM 1111 General Chemistry I (4 credits)
- CHEM 1112 General Chemistry II (4 credits)

B. SELECT 1 OF THE FOLLOWING COURSES:

- STAT 2610 Applied Statistics (4 credits)
- PSY 3401 Basic Statistics for Research (4 credits)

C. SELECT 1 OF THE FOLLOWING GROUPS:

GROUP 1:
- PHYS 2101 Physics I (5 credits)
- PHYS 2102 Physics II (5 credits)

**GROUP 2:**

- PHYS 1101 General Physics I (4 credits)
- PHYS 1102 General Physics II (4 credits)

**D. COMPLETE THE FOLLOWING 4 COURSES:**

- CHEM 3311 Organic Chemistry I (3 credits)
- CHEM 3312 Organic Chemistry II (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)
- CHEM 3372 Organic Chemistry Laboratory II (1 credit)
Clean Copy of Biology, B.S. major Cellular and Molecular emphasis

Biology, B.S. major

Required Credits: 71
Required GPA: 2.25

I REQUIRED BIOLOGY CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)

II REQUIRED CELLULAR AND MOLECULAR EMPHASIS CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BCMB/Biol 3074 Molecular Techniques (2 credits)
- BCMB/Biol 3075 Cellular Techniques (2 credits)
- BIOL 3380 Molecular Genetics (3 credits)
- BIOL 3580 Immunology (3 credits)
- BIOL 3590 Cell Biology (3 credits)
- BIOL 3710 Microbiology (4 credits)

III CAPSTONE PROJECT

The Biology capstone project, completed in the senior year, provides a culminating experience that integrates the knowledge and skills learned in previous courses and applies them to a scholarly activity.

The capstone project must be designed or chosen by the student in consultation with a faculty mentor or advisor, who must approve the project before work begins. Students should consult with their faculty mentor or advisor before their senior year commences. All capstone projects will include a written and oral component (except for professional/graduate school entrance exams) and provides a culminating experience that integrates the knowledge and skills learned in previous courses and applies them to a scholarly activity.

Required capstone project courses (4 credits total).
Select 1 of the following options:

OPTION 1

- BIOL 4894 Advanced Research Project I (2 credits)
  and BIOL 4895 Advanced Research Project II (2 credits)
OPTION 2

- BIOL 4449 Gene Expression (4 credits)

IV REQUIRED CELLULAR AND MOLECULAR EMPHASIS ELECTIVES

SELECT 7 SEMESTER CREDITS FROM THE FOLLOWING COURSES:

- BIOL 3260 Human Physiology (4 credits)
- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3337 Science Communication (3 credits)
- BIOL 3338 Science Communication Lab (1 credits)
- BIOL 3339 Bioethics (3 credits)
- BIOL 4360 Developmental and Tumor Biology (3 credits)
- BIOL 4447 Genomics (3 credits)
- BIOL 4448 Genomics Lab (2 credits)
- BIOL 4460 Stem Cells and Regenerative Medicine (3 credits)
- BIOL 4470 Introduction to Vaccinology (4 credits)
- BIOL 4715 Clinical Microbiology (3 credits)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)

V REQUIRED COURSES IN RELATED FIELDS

A. SELECT 1 OF THE FOLLOWING GROUPS:

GROUP 1:

- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)

GROUP 2:

- CHEM 1111 General Chemistry I (4 credits)
- CHEM 1112 General Chemistry II (4 credits)

B. SELECT 1 OF THE FOLLOWING COURSES:

- STAT 2610 Applied Statistics (4 credits)
- PSY 3401 Basic Statistics for Research (4 credits)

C. SELECT 1 OF THE FOLLOWING GROUPS:

GROUP 1:

- PHYS 2101 Physics I (5 credits)
- PHYS 2102 Physics II (5 credits)
GROUP 2:

- PHYS 1101 General Physics I (4 credits)
- PHYS 1102 General Physics II (4 credits)

D. COMPLETE THE FOLLOWING 4 COURSES:

- CHEM 3311 Organic Chemistry I (3 credits)
- CHEM 3312 Organic Chemistry II (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)
- CHEM 3372 Organic Chemistry Laboratory II (1 credit)
BSU Curriculum Forms

Form 5

Program Modification Form

Program to be modified: Biology B.S. major Medical Sciences Emphasis

List all proposed change(s):
- Required core of the emphasis will decrease by one credit and the required electives will increase by one credit (no change to total credits required for the emphasis).
- BIOL 3580 Immunology (core requirement), BIOL 3380 Molecular Genetics (elective), BIOL 3590 Cell Biology (elective) are all reduced from 4 to 3 credits.
- BIOL 4449 Gene Expression (4 credits) is added as a potential capstone course.
- Drop BIOL 2110 Human Anatomy and Physiology (5 cr) from electives
- Several additional biology courses that are consistent with the aims of the emphasis have been added to the electives section: BIOL 3300 Introduction to Hematology (4 credits) BIOL 3337 Science Communication (3 credits), BIOL 3338 Science Communication Lab(1 credits), BIOL 3339 Bioethics (3 credits) BIOL 4447 Genomics (3 credits), BIOL 4448 Genomics Lab (2 credits), BIOL 4460 Stem Cells and Regenerative Medicine (3 credits), BIOL 4470 Introduction to Vaccinology (4 credits), BIOL 4715 Clinical Microbiology (3 credits)

Reason(s) for the change(s):
- Changes are required for consistency with course modifications and changes that are occurring as part of the implementation of a BCMB major.
- Additional courses that have been recently added or are being added to the biology major are included as additional electives.

Note: In order to avoid hidden prerequisites, if a course is being dropped from this program (but not from the entire curriculum), please check for which remaining courses may include this dropped course as a prerequisite. Course prerequisites may be found in the online catalog (http://www.bemidjistate.edu/academics/catalog/). Remedies for hidden prerequisites may be found under Curriculum Forms at (http://www.bemidjistate.edu/faculty_staff/faculty_association/forms/).

Note: If a course from another department/program was either added to or dropped from this program, please notify the chair/coordinator of that course's department/program and indicate the following:
The course’s home department/program was notified of the addition or dropping of their course(s) on __________ (date) by __________________ (mail, email, or phone).

Please check one of the items below:
No comments were received from other programs or departments within one week of the notification.

Comments were received within one week of the notification, and are attached.

**Note:** If this is a joint program, the signatures of both department chairs (and both deans, if different colleges) must be provided.

**Alert:** Attach a copy of the current program showing the marked changes. Please copy the current program from the online catalog ([http://www.bemidjistate.edu/academics/catalog/](http://www.bemidjistate.edu/academics/catalog/)) and paste it into Word. Then use either the Track Changes feature under Tools, or the underline and strikethrough Font feature under Format. (Please note that the Track Changes feature may be easily switched on and off by holding down the Ctrl+Shift+E keys.)
Biology, B.S. major

Required Credits: 71
Required GPA: 2.25

I REQUIRED BIOLOGY CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)

II REQUIRED MEDICAL SCIENCES CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 3250 Comparative Vertebrate Human Anatomy (4 credits)
- BIOL 3260 Medical Human Physiology (4 credits)
- BIOL 3580 Immunology (4 to 3 credits)
- BIOL 3710 Microbiology (4 credits)

III CAPSTONE PROJECT

The Biology capstone project, completed in the senior year, provides a culminating experience that integrates the knowledge and skills learned in previous courses and applies them to a scholarly activity. Examples of capstone projects may include original research projects, internships with state or federal agencies, shadowing experiences with professionals, or successfully passing professional/graduate school entrance exams. The capstone project must be designed or chosen by the student in consultation with a faculty mentor or advisor, who must approve the project before work begins. Students should consult with their faculty mentor or advisor before their senior year commences. All capstone projects will include a written and oral component (except for professional/graduate school entrance exams).

The capstone project may be completed in one of the following ways (0-4 credits):

1. Students using a professional or graduate entrance exam as their capstone project must register for this course. Students must place in at least the 60th percentile on their exam to successfully complete this course.
   - BIOL 4800 Advanced Project Certification (0 credit)

2. Complete BIOL 4894 OR BIOL 4895 (2 credits):
3. Complete BIOL 4894 AND BIOL 4895 (2 credits each):
   - BIOL 4894 Advanced Research Project I (2 credits)
   - BIOL 4895 Advanced Research Project II (2 credits)

4. Complete BIOL 4449 Gene Expression (4 credits)

IV REQUIRED MEDICAL SCIENCES ELECTIVES

SELECT 12 CREDITS OF ELECTIVES FROM THE FOLLOWING:

- BIOL 2110 Human Anatomy and Physiology (5 credits)
- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3337 Science Communication (3 credits)
- BIOL 3338 Science Communication Lab (1 credit)
- BIOL 3339 Bioethics (3 credits)
- BIOL 3380 Molecular Genetics: Theory and Practice (4 to 3 credits)
- BIOL 3590 Cell Biology (4 to 3 credits)
- BIOL 4210 Parasitology (4 credits)
- BIOL 4270 Histology (4 credits)
- BIOL 4360 Developmental and Tumor Biology (4 to 3 credits)
- BIOL 4447 Genomics (3 credits)
- BIOL 4448 Genomics Lab (2 credits)
- BIOL 4460 Stem Cells and Regenerative Medicine (3 credits)
- BIOL 4470 Introduction to Vaccinology (4 credits)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)

V REQUIRED COURSES IN RELATED FIELDS

A. SELECT 1 OF THE FOLLOWING GROUPS:

GROUP 1:

- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)

GROUP 2:

- CHEM 1111 General Chemistry I (4 credits)
- CHEM 1112 General Chemistry II (4 credits)

B. SELECT 1 OF THE FOLLOWING COURSES:
• STAT 2610 Applied Statistics (4 credits)
• PSY 3401 Basic Statistics for Research (4 credits)

C. SELECT 1 OF THE FOLLOWING GROUPS:

GROUP 1:
• PHYS 2101 Physics I (5 credits)
• PHYS 2102 Physics II (5 credits)

GROUP 2:
• PHYS 1101 General Physics I (4 credits)
• PHYS 1102 General Physics II (4 credits)

D. COMPLETE THE FOLLOWING 4 COURSES:

• CHEM 3311 Organic Chemistry I (3 credits)
• CHEM 3312 Organic Chemistry II (3 credits)
• CHEM 3371 Organic Chemistry Laboratory I (1 credit)
• CHEM 3372 Organic Chemistry Laboratory II (1 credit)
Clean copy of Biology, B.S. major Medical Sciences emphasis

Biology, B.S. major

Required Credits: 71
Required GPA: 2.25

I REQUIRED BIOLOGY CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)

II REQUIRED MEDICAL SCIENCES CORE COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 3250 Human Anatomy (4 credits)
- BIOL 3260 Human Physiology (4 credits)
- BIOL 3580 Immunology (3 credits)
- BIOL 3710 Microbiology (4 credits)

III CAPSTONE PROJECT

The Biology capstone project, completed in the senior year, provides a culminating experience that integrates the knowledge and skills learned in previous courses and applies them to a scholarly activity. Examples of capstone projects may include original research projects, internships with state or federal agencies, shadowing experiences with professionals, or successfully passing professional/graduate school entrance exams. The capstone project must be designed or chosen by the student in consultation with a faculty mentor or advisor, who must approve the project before work begins. Students should consult with their faculty mentor or advisor before their senior year commences. All capstone projects will include a written and oral component (except for professional/graduate school entrance exams).

The capstone project may be completed in one of the following ways (0-4 credits):

1. Students using a professional or graduate entrance exam as their capstone project must register for this course. Students must place in at least the 60th percentile on their exam to successfully complete this course.

   - BIOL 4800 Advanced Project Certification (0 credit)
2. Complete BIOL 4894 OR BIOL 4895 (2 credits):
   - BIOL 4894 Advanced Research Project I (2 credits)
   - BIOL 4895 Advanced Research Project II (2 credits)

3. Complete BIOL 4894 AND BIOL 4895 (2 credits each):
   - BIOL 4894 Advanced Research Project I (2 credits)
   - BIOL 4895 Advanced Research Project II (2 credits)

4. Complete BIOL 4449 Gene Expression (4 credits)

IV REQUIRED MEDICAL SCIENCES ELECTIVES

SELECT 13 CREDITS OF ELECTIVES FROM THE FOLLOWING:

- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3337 Science Communication (3 credits)
- BIOL 3338 Science Communication Lab (1 credit)
- BIOL 3339 Bioethics (3 credits)
- BIOL 3380 Molecular Genetics (3 credits)
- BIOL 3590 Cell Biology (3 credits)
- BIOL 4210 Parasitology (4 credits)
- BIOL 4270 Histology (4 credits)
- BIOL 4360 Developmental and Tumor Biology (3 credits)
- BIOL 4447 Genomics (3 credits)
- BIOL 4448 Genomics Lab (2 credits)
- BIOL 4460 Stem Cells and Regenerative Medicine (3 credits)
- BIOL 4470 Introduction to Vaccinology (4 credits)
- BIOL 4715 Clinical Microbiology (3 credits)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)

V REQUIRED COURSES IN RELATED FIELDS

A. SELECT 1 OF THE FOLLOWING GROUPS:

GROUP 1:

- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)

GROUP 2:

- CHEM 1111 General Chemistry I (4 credits)
- CHEM 1112 General Chemistry II (4 credits)
B. SELECT 1 OF THE FOLLOWING COURSES:

- STAT 2610 Applied Statistics (4 credits)
- PSY 3401 Basic Statistics for Research (4 credits)

C. SELECT 1 OF THE FOLLOWING GROUPS:

**GROUP 1:**

- PHYS 2101 Physics I (5 credits)
- PHYS 2102 Physics II (5 credits)

**GROUP 2:**

- PHYS 1101 General Physics I (4 credits)
- PHYS 1102 General Physics II (4 credits)

D. COMPLETE THE FOLLOWING 4 COURSES:

- CHEM 3311 Organic Chemistry I (3 credits)
- CHEM 3312 Organic Chemistry II (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)
- CHEM 3372 Organic Chemistry Laboratory II (1 credit)
BSU Curriculum Forms

Form 5

Program Modification Form

Program to be modified: Chemistry, B.S. major Biochemistry/Biotechnology emphasis

List all proposed change(s):
- BIOL 3580 Immunology (4 credits) to Immunology (3 credits)
- BIOL 3590 Cell Biology (4 credits) to Cell Biology (3 credits)
- Major decreases from 66 to 64 credits

Reason(s) for the change(s):
The number of credits for these two course has decreased from 4 to 3 each

Note: In order to avoid hidden prerequisites, if a course is being dropped from this program (but not from the entire curriculum), please check for which remaining courses may include this dropped course as a prerequisite. Course prerequisites may be found in the online catalog (http://www.bemidjistate.edu/academics/catalog/). Remedies for hidden prerequisites may be found under Curriculum Forms at (http://www.bemidjistate.edu/faculty_staff/faculty_association/forms/).

Note: If a course from another department/program was either added to or dropped from this program, please notify the chair/coordinator of that course's department/program and indicate the following:
The course’s home department/program was notified of the addition or dropping of their course(s) on ________ (date) by __________________ (mail, email, or phone).

Please check one of the items below:

______ No comments were received from other programs or departments within one week of the notification.

______ Comments were received within one week of the notification, and are attached.

Note: If this is a joint program, the signatures of both department chairs (and both deans, if different colleges) must be provided.

Alert: Attach a copy of the current program showing the marked changes. Please copy the current program from the online catalog (http://www.bemidjistate.edu/academics/catalog/) and paste it into Word. Then use either the Track Changes feature under Tools, or the underline and strikethrough Font feature under Format. (Please note that the Track Changes feature may be easily switched on and off by holding down the Ctrl+Shift+E keys.)
Chemistry, B.S. major  Biochemistry/Biotechnology emphasis

Required Credits: 66
Required GPA: 2.25

I REQUIRED COURSES

SELECT 1 OF THE FOLLOWING COURSES:

- CHEM 1111  General Chemistry I (4 credits)
- CHEM 2211  Principles of Chemistry I (4 credits)

COMPLETE THE FOLLOWING COURSES:

- CHEM 2212  Principles of Chemistry II (4 credits)
- CHEM 3100  Journal Club (1 credit)
- CHEM 3311  Organic Chemistry I (3 credits)
- CHEM 3312  Organic Chemistry II (3 credits)
- CHEM 3371  Organic Chemistry Laboratory I (1 credit)
- CHEM 3372  Organic Chemistry Laboratory II (1 credit)
- CHEM 3507  Analytical Chemistry (3 credits)
- CHEM 3570  Analytical Chemistry Laboratory (1 credit)
- CHEM 4510  Instrumental Methods of Analysis (3 credits)
- CHEM 4571  Instrumental Analysis Laboratory I (1 credit)
- CHEM 4572  Instrumental Analysis Laboratory II (1 credit)
- MATH 2471  Calculus I (5 credits)
- PHYS 2101  Physics I (5 credits)

II REQUIRED EMPHASIS

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211  Introductory Biology I (4 credits)
- BIOL 1212  Introductory Biology II (4 credits)
- CHEM 4411  Biochemistry I (3 credits)
- CHEM 4412  Biochemistry II (3 credits)
- CHEM 4471  Biochemistry Laboratory I (1 credit)
- CHEM 4472  Biochemistry Laboratory II (1 credit)

SELECT 2 OF THE FOLLOWING COURSES:

- BIOL 2110  Human Anatomy and Physiology (5 credits)
- BIOL 2360  Genetics (4 credits)
- BIOL 3580  Immunology (4 3 credits)
- BIOL 3590  Cell Biology (4 3 credits)
- BIOL 3710  Microbiology (4 credits)

II REQUIRED EMPHASIS
Select 6 semester credits from CHEM 3100 or above. Up to 3 semester credits of research (CHEM 3980 or 4980) and internship (CHEM 3970 or 4970) may be used in this area. CHEM 3100 may be repeated with 1 credit applying to this area.
Clean copy of Chemistry, B.S. Biochemistry/Biotechnology Emphasis

Chemistry, B.S. major

Required Credits: 64
Required GPA: 2.25

I REQUIRED COURSES

SELECT 1 OF THE FOLLOWING COURSES:

- CHEM 1111 General Chemistry I (4 credits)
- CHEM 2211 Principles of Chemistry I (4 credits)

COMPLETE THE FOLLOWING COURSES:

- CHEM 2212 Principles of Chemistry II (4 credits)
- CHEM 3100 Journal Club (1 credit)
- CHEM 3311 Organic Chemistry I (3 credits)
- CHEM 3312 Organic Chemistry II (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)
- CHEM 3372 Organic Chemistry Laboratory II (1 credit)
- CHEM 3507 Analytical Chemistry (3 credits)
- CHEM 3570 Analytical Chemistry Laboratory (1 credit)
- CHEM 4510 Instrumental Methods of Analysis (3 credits)
- CHEM 4571 Instrumental Analysis Laboratory I (1 credit)
- CHEM 4572 Instrumental Analysis Laboratory II (1 credit)
- MATH 2471 Calculus I (5 credits)
- PHYS 2101 Physics I (5 credits)

II REQUIRED EMPHASIS

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4412 Biochemistry II (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)
- CHEM 4472 Biochemistry Laboratory II (1 credit)

SELECT 2 OF THE FOLLOWING COURSES:

- BIOL 2110 Human Anatomy and Physiology (5 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 3580 Immunology (3 credits)
- BIOL 3590 Cell Biology (3 credits)
- BIOL 3710 Microbiology (4 credits)
II REQUIRED EMPHASIS

Select 6 semester credits from CHEM 3100 or above. Up to 3 semester credits of research (CHEM 3980 or 4980) and internship (CHEM 3970 or 4970) may be used in this area. CHEM 3100 may be repeated with 1 credit applying to this area.

SUGGESTED SEMESTER SCHEDULE FOR CHEMISTRY MAJOR, B.S
Biochemistry/Biotechnology Emphasis

Freshman
- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- Liberal Education requirements
- Electives

Sophomore
- CHEM 3311 Organic Chemistry I (3 credits)
- CHEM 3312 Organic Chemistry II (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)
- CHEM 3372 Organic Chemistry Laboratory II (1 credit)
- CHEM 3507 Analytical Chemistry (3 credits)
- CHEM 3570 Analytical Chemistry Laboratory (1 credit)
- Biology elective
- Liberal Education requirements

Junior/Senior
- CHEM 3100 Journal Club (1 credit)
- CHEM 4510 Instrumental Methods of Analysis (3 credits)
- CHEM 4571 Instrumental Analysis Laboratory I (1 credit)
- CHEM 4572 Instrumental Analysis Laboratory II (1 credit)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4412 Biochemistry II (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)
- CHEM 4472 Biochemistry Laboratory II (1 credit)
- Biology elective
- Chemistry electives
- Complete Liberal Education requirements
BSU Curriculum Forms

Form 5

Program Modification Form

Program to be modified: Chemistry, BS Criminalistics emphasis

List all proposed change(s):
- Replace BIOL 3380 Molecular Genetics: Theory and Practice (4 cr) with BIOL 3380 Molecular Genetics (3 cr)
- major decreases from 78 to 77 credits

Reason(s) for the change(s):
- The number of the credits for the course decreased from 4 to 3.

Note: In order to avoid hidden prerequisites, if a course is being dropped from this program (but not from the entire curriculum), please check for which remaining courses may include this dropped course as a prerequisite. Course prerequisites may be found in the online catalog (http://www.bemidjistate.edu/academics/catalog/). Remedies for hidden prerequisites may be found under Curriculum Forms at (http://www.bemidjistate.edu/faculty_staff/faculty_association/forms/).

Note: If a course from another department/program was either added to or dropped from this program, please notify the chair/coordinator of that course's department/program and indicate the following:
The course’s home department/program was notified of the addition or dropping of their course(s) on __________ (date) by __________________ (mail, email, or phone).

Please check one of the items below:

______ No comments were received from other programs or departments within one week of the notification.

______ Comments were received within one week of the notification, and are attached.

Note: If this is a joint program, the signatures of both department chairs (and both deans, if different colleges) must be provided.

Alert: Attach a copy of the current program showing the marked changes. Please copy the current program from the online catalog (http://www.bemidjistate.edu/academics/catalog/) and paste it into Word. Then use either the Track Changes feature under Tools, or the underline and strikethrough.
Chemistry, B.S. major Criminalistics Emphasis

Required Credits: 78
Required GPA: 2.25

I REQUIRED COURSES

SELECT 1 OF THE FOLLOWING COURSES:

- CHEM 1111 General Chemistry I (4 credits)
- CHEM 2211 Principles of Chemistry I (4 credits)

COMPLETE THE FOLLOWING COURSES:

- CHEM 2212 Principles of Chemistry II (4 credits)
- CHEM 3100 Journal Club (1 credit)
- CHEM 3311 Organic Chemistry I (3 credits)
- CHEM 3312 Organic Chemistry II (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)
- CHEM 3372 Organic Chemistry Laboratory II (1 credit)
- CHEM 3507 Analytical Chemistry (3 credits)
- CHEM 3570 Analytical Chemistry Laboratory (1 credit)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)
- CRJS 1120 Criminal Justice and Society (3 credits)
- CRJS 3358 Criminal Law (3 credits)
- STAT 2610 Applied Statistics (4 credits)

II REQUIRED EMPHASIS

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 3380 Molecular Genetics: Theory and Practice (4-5 credits)
- CHEM 2210 Criminalistics (3 credits)
- CHEM 2270 Criminalistics Laboratory (1 credit)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)
- CRJS 1120 Criminal Justice and Society (3 credits)
- CRJS 3358 Criminal Law (3 credits)
- CRJS 3359 Criminal Investigation (3 credits)
- STAT 2610 Applied Statistics (4 credits)

COMPLETE THE FOLLOWING COURSE:

- CHEM 4970 Internship (3 credits)
SELECT 1 OF THE FOLLOWING COURSES:

- CHEM 4711 Physical Chemistry I (3 credits)
- CHEM 4712 Physical Chemistry II (3 credits)
Chemistry, B.S. major Criminalistics Emphasis

Required Credits: 77
Required GPA: 2.25

I REQUIRED COURSES

SELECT 1 OF THE FOLLOWING COURSES:

- CHEM 1111 General Chemistry I (4 credits)
- CHEM 2211 Principles of Chemistry I (4 credits)

COMPLETE THE FOLLOWING COURSES:

- CHEM 2212 Principles of Chemistry II (4 credits)
- CHEM 3100 Journal Club (1 credit)
- CHEM 3311 Organic Chemistry I (3 credits)
- CHEM 3312 Organic Chemistry II (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)
- CHEM 3372 Organic Chemistry Laboratory II (1 credit)
- CHEM 3507 Analytical Chemistry (3 credits)
- CHEM 3570 Analytical Chemistry Laboratory (1 credit)
- CHEM 4510 Instrumental Methods of Analysis (3 credits)
- CHEM 4571 Instrumental Analysis Laboratory I (1 credit)
- CHEM 4572 Instrumental Analysis Laboratory II (1 credit)
- MATH 2471 Calculus I (5 credits)
- PHYS 2101 Physics I (5 credits)

II REQUIRED EMPHASIS

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 3380 Molecular Genetics (3 credits)
- CHEM 2210 Criminalistics (3 credits)
- CHEM 2270 Criminalistics Laboratory (1 credit)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)
- CRJS 1120 Criminal Justice and Society (3 credits)
- CRJS 3358 Criminal Law (3 credits)
- CRJS 3359 Criminal Investigation (3 credits)
- STAT 2610 Applied Statistics (4 credits)

COMPLETE THE FOLLOWING COURSE:

- CHEM 4970 Internship (3 credits)

SELECT 1 OF THE FOLLOWING COURSES:
• CHEM 4711 Physical Chemistry I (3 credits)
• CHEM 4712 Physical Chemistry II (3 credits)

SUGGESTED SEMESTER SCHEDULE

Freshman

• CHEM 2211 Principles of Chemistry I (4 credits)
• CHEM 2212 Principles of Chemistry II (4 credits)
• BIOL 1211 Introductory Biology I (4 credits)
• BIOL 1212 Introductory Biology II (4 credits)
• CRJS 1120 Criminal Justice and Society (3 credits)
• Liberal Education requirements
• Electives

Sophomore

• CHEM 3311 Organic Chemistry I (3 credits)
• CHEM 3312 Organic Chemistry II (3 credits)
• CHEM 3371 Organic Chemistry Laboratory I (1 credit)
• CHEM 3372 Organic Chemistry Laboratory II (1 credit)
• CHEM 3507 Analytical Chemistry (3 credits)
• CHEM 3570 Analytical Chemistry Laboratory (1 credit)
• CHEM 2210 Criminalistics (3 credits)
• CHEM 2270 Criminalistics Laboratory (1 credit)
• BIOL 3380 Molecular Genetics (3 credits)
• Liberal Education requirements

Junior/Senior

• CHEM 3100 Journal Club (1 credit)
• CHEM 4510 Instrumental Methods of Analysis (3 credits)
• CHEM 4571 Instrumental Analysis Laboratory I (1 credit)
• CHEM 4572 Instrumental Analysis Laboratory II (1 credit)
• CHEM 4411 Biochemistry I (3 credits)
• CHEM 4471 Biochemistry Laboratory I (1 credit)
• CRJS 3358 Criminal Law (3 credits)
• CRJS 3359 Criminal Investigation (3 credits)
• STAT 2610 Applied Statistics (4 credits)
• CHEM 4970 Internship (3 credits)
• Electives
BSU Curriculum Forms

Form 5

Program Modification Form

Program to be modified: Medical Laboratory Science B.S. 3+1

List all proposed change(s):

- Drop BIOL 1212 Introductory Biology II (4 cr) as a required course.
- Drop BIOL 2110 Human Anatomy and Physiology (5 cr) and replace with BIOL 3260 Human Physiology (4 cr)
- Drop BIOL 3380 Molecular Genetics: Theory and Practice (4 cr) and replace with BIOL 2360 Genetics (4 cr)
- Drop CHEM 4471 Biochemistry Laboratory I (1 credit) as a required course
- Add BIOL 4715 Clinical Microbiology (3 cr)
- Add BCMB/BIOL 3074 Molecular Techniques (2 credits)
- Reduce BIOL 3580 Immunology from 4 cr to 3 cr
- Overall credits in the program increase to 88.
- Changes have also been made to the text of the program description for greater clarity. This includes removing recommended courses from the student academic schedule and replacing it with a list of recommended courses.

Reason(s) for the change(s):

- Changes are required for consistency with course modifications and changes that are occurring as part of the implementation of a BCMB major.
- Changes are also being made to better prepare students for their clinical year coursework. Specifically, the addition of the Clinical Microbiology course and the Molecular Techniques course should greatly enhance student preparedness for the advanced clinical year coursework.

Note: In order to avoid hidden prerequisites, if a course is being dropped from this program (but not from the entire curriculum), please check for which remaining courses may include this dropped course as a prerequisite. Course prerequisites may be found in the online catalog (http://www.bemidjistate.edu/academics/catalog/). Remedies for hidden prerequisites may be found under Curriculum Forms at (http://www.bemidjistate.edu/faculty_staff/faculty_association/forms/).

Note: If a course from another department/program was either added to or dropped from this program, please notify the chair/coordinator of that course's department/program and indicate the following:
The course’s home department/program was notified of the addition or dropping of their course(s) on ________ (date) by ________________ (mail, email, or phone).

Please check one of the items below:
______ No comments were received from other programs or departments within one week of the notification.

______ Comments were received within one week of the notification, and are attached.

**Note:** If this is a joint program, the signatures of both department chairs (and both deans, if different colleges) must be provided.

**PLEASE NOTE FOR THIS PROGRAM:** MLS at BSU is a program that is run in affiliation with the UND MLS program. Students are required to take liberal education courses and some advanced biology/chemistry courses here at BSU before applying to the UND portion of the program. Students ultimately are awarded an MLS degree through the BSU Biology Department (CAS) after they complete 37 credits of coursework through the UND program. Changes that are proposed within this BSU major, however, have been approved by UND as well (see email correspondence at the end of the form).

**Alert:** Attach a copy of the current program showing the marked changes. Please copy the current program from the online catalog ([http://www.bemidjistate.edu/academics/catalog/](http://www.bemidjistate.edu/academics/catalog/)) and paste it into Word. Then use either the Track Changes feature under Tools, or the underline and strikethrough Font feature under Format. (Please note that the Track Changes feature may be easily switched on and off by holding down the Ctrl+Shift+E keys.)
Medical Laboratory Science, B.S. major

In this option, the student completes the required Medical Laboratory Science and Liberal Education courses at Bemidji State University, and then applies for admission to the clinical year program through the University of North Dakota or other affiliated institution. Please be aware admission to a clinical year program is competitive and not guaranteed; however, completion of a clinical year is required to complete a MLS 3+1 major. (Additionally, a minimum 2.80 GPA overall and in science courses is one a requirement for admission to a for entrance into the clinical year program).

The Medical Laboratory Science student must consult with the Medical Laboratory Science advisor at the start of the academic program and regularly throughout the course of study. The student must complete the Bemidji State University Liberal Education requirements before the year of clinical study.

Required Credits: 84
Required GPA: 2.25 (Required for graduation from BSU – Please see information above regarding GPA requirements for the MLS 3+1 program.)

I REQUIRED COURSES

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2130 Human Anatomy and Physiology (5 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 3074 Molecular Techniques (2 credits) or BCMB 3074 Molecular Techniques (2 credits)
- BIOL 3260 Human Physiology (4 credits)
- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3380 Molecular Genetics: Theory and Practice (4 credits)
- BIOL 3580 Immunology (4 to 3 credits)
- BIOL 3710 Microbiology (4 credits)
- BIOL 4210 Parasitology (4 credits)
- BIOL 4715 Clinical Microbiology (3 credits)
- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- CHEM 3311 Organic Chemistry I (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)

SELECT 1 OF THE FOLLOWING COURSES:

- MATH 1170 College Algebra (4 credits)
- MATH 1470 PreCalculus (5 credits)
THE FOLLOWING COURSES ARE RECOMMENDED, BUT NOT REQUIRED FOR COMPLETION OF THE MAJOR:

- BIOL 1212 Introductory Biology II (4 credits)
- STAT 2610 Applied Statistics (4 credits)
  or PSY 3401 Basic Statistics for Research (4 credits)
- CHEM 3312 Organic Chemistry II (3 credits)
- CHEM 3372 Organic Chemistry Laboratory II (1 credit)
- CHEM 4471 Biochemistry Laboratory I (1 credit)

II REQUIRED CLINICAL STUDIES

Clinical year courses, taken during the senior year beginning with summer term, are taken through entrance into the clinical year program at the University of North Dakota or at affiliated hospitals. The clinical year will consist of at least 37 credits.

NOTE: A clinical year position is not guaranteed. Students must apply for a clinical year position in October of the junior year. Please see advisor regarding the clinical year of study.

SUGGESTED SEMESTER SCHEDULE FOR MEDICAL LABORATORY SCIENCE MAJOR, B.S. (3+1)

The following is a list of Medical Laboratory Science courses arranged by year. This suggested schedule is intended to help students plan their courses without course conflicts. Courses that are asterisked(*) are recommended but not required.

Freshman

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2310 Human Anatomy and Physiology (5 credits)
- BIOL 2360 Genetics (4 credits)
- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- ENGL 1151 Composition (3 credits)
- ENGL 2152 Argument and Exposition (3 credits)
- MATH 1170 College Algebra (4 credits)
  or MATH 1470 Precalculus (5 credits)
- Additional liberal education requirements

Sophomore

- BIOL 2360 Genetics (4 credits)
- BIOL 3380 Molecular Genetics: Theory and Practice (4 credits)
- BIOL 3074 Molecular Techniques (2 credits)
  or BCMB 3074 Molecular Techniques (2 credits)
- BIOL 3260 Human Physiology (4 credits)
- BIOL 3710 Microbiology (4 credits)
- BIOL 3755 Medical Microbiology (3 credits)
- BIOL 4210 Parasitology (4 credits)
- CHEM 3311 Organic Chemistry I (3 credits)
- *CHEM 3312 Organic Chemistry II (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)
- *CHEM 3372 Organic Chemistry Laboratory II (1 credit)
- Additional liberal education requirements

Junior

- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3580 Immunology (4 to 3 credits)
- BIOL 4210 Parasitology (4 credits)
- BIOL 4715 Clinical Microbiology (3 credits)
- CHEM 4411 Biochemistry I (3 credits)
- *CHEM 4471 Biochemistry Laboratory I (1 credit)
- STAT 2610 Applied Statistics (4 credits)
  or PSY 3401 Basic Statistics for Research (4 credits)
- Any remaining liberal education requirements

Senior

- Clinical year courses
**Medical Laboratory Science, B.S. major**

In this option, the student completes the required Medical Laboratory Science and Liberal Education courses at Bemidji State University, and then applies for admission to the clinical year program through the University of North Dakota or other affiliated institution. Please be aware admission to a clinical year program is competitive and not guaranteed; however, completion of a clinical year is required to complete a MLS 3+1 major. Additionally, a minimum 2.80 GPA in science courses is a requirement for admission to a clinical year program.

The Medical Laboratory Science student must consult with the Medical Laboratory Science advisor at the start of the academic program and regularly throughout the course of study. The student must complete the Bemidji State University Liberal Education requirements before the year of clinical study.

Required Credits: 88
Required GPA: 2.25 (Required for graduation from BSU—please see information above regarding GPA requirements for the MLS 3+1 program)

**I REQUIRED COURSES**

COMPLETE THE FOLLOWING COURSES:

- BIOL 1211 *Introductory Biology I* (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 3260 Human Physiology (4 credits)
- BIOL 3074 Molecular Techniques (2 credits)
  or BCMB 3074 Molecular Techniques (2 credits)
- BIOL 3300 *Introduction to Hematology* (4 credits)
- BIOL 3580 *Immunology* (3 credits)
- BIOL 3710 *Microbiology* (4 credits)
- BIOL 4210 *Parasitology* (4 credits)
- BIOL 4715 Clinical Microbiology (3 credits)
- CHEM 2211 *Principles of Chemistry I* (4 credits)
- CHEM 2212 *Principles of Chemistry II* (4 credits)
- CHEM 3311 *Organic Chemistry I* (3 credits)
- CHEM 3371 *Organic Chemistry Laboratory I* (1 credit)
- CHEM 4411 *Biochemistry I* (3 credits)

SELECT 1 OF THE FOLLOWING COURSES:

- MATH 1170 *College Algebra* (4 credits)
- MATH 1470 *Precalculus* (5 credits)

THE FOLLOWING COURSES ARE RECOMMENDED, BUT NOT REQUIRED FOR COMPLETION OF THE MAJOR:
• BIOL 1212 Introductory Biology II (4 credits)
• STAT 2610 Applied Statistics (4 credits)
  or PSY 3401 Basic Statistics for Research (4 credits)
• CHEM 3312 Organic Chemistry II (3 credits)
• CHEM 3372 Organic Chemistry Laboratory II (1 credit)
• CHEM 4471 Biochemistry Laboratory I (1 credit)

II REQUIRED CLINICAL STUDIES

Clinical year courses, taken during the senior year beginning with summer term, are taken through entrance into the clinical year program at the University of North Dakota or at affiliated hospitals. The clinical year will consist of at least 37 credits.

NOTE: A clinical year position is not guaranteed. Students must apply for a clinical year position in October of the junior year. Please see advisor regarding the clinical year of study.

SUGGESTED SEMESTER SCHEDULE FOR MEDICAL LABORATORY SCIENCE MAJOR, B.S. 3+1 option

The following is a list of Medical Laboratory Science courses arranged by year. This suggested schedule is intended to help students plan their courses without course conflicts.

Freshman

• BIOL 1121 Introductory Biology I (4 credits)
• BIOL 2360 Genetics (4 credits)
• CHEM 2211 Principles of Chemistry I (4 credits)
• CHEM 2212 Principles of Chemistry II (4 credits)
• ENGL 1151 Composition (3 credits)
• ENGL 2152 Argument and Exposition (3 credits)
• MATH 1170 College Algebra (4 credits)
  or MATH 1470 Precalculus (5 credits)
• Additional liberal education requirements

Sophomore

• BCMB/BIOL 3074 Molecular Techniques (2 credits)
• BIOL 3260 Human Physiology (4 credits)
• BIOL 3710 Microbiology (4 credits)
• BIOL 4210 Parasitology (4 credits)
• CHEM 3311 Organic Chemistry I (3 credits)
• CHEM 3371 Organic Chemistry Laboratory I (1 credit)
• Additional liberal education requirements
Junior

- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3580 Immunology (3 credits)
- BIOL 4715 Clinical Microbiology (3 credits)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)
- STAT 2610 Applied Statistics (4 credits) or PSY 3401 Basic Statistics for Research (4 credits)
- Any remaining liberal education requirements

Senior

- Clinical year courses
I was actually able to talk with advisors this morning, and we all agreed that the changes you are proposing below will work for our program requirements! Thanks again for your work on this.

Brooke Solberg, PhD, MLS(ASCP)CM
Associate Professor & Chair – Dept. of Medical Laboratory Science
UND School of Medicine and Health Sciences
ph. 701-777-2245
brooke.solberg@med.und.edu

From: Paur, Ruth
Sent: Wednesday, February 07, 2018 8:44 AM
To: Solberg, Brooke <brooke.solberg.1@med.und.edu>
Subject: Fw: MLS course changes

Hi Mike!

I have taken over for Ruth (or at least trying to!), as she retired in December. I will take a look at the changes proposed below and run them through our advisors, and hopefully get back to you early next week. I also hope to get a message out to all WCAMLS advisors just to introduce myself and get feedback. Thanks for working on the agreement and the curriculum!

Brooke Solberg, PhD, MLS(ASCP)CM
Associate Professor & Chair – Dept. of Medical Laboratory Science
UND School of Medicine and Health Sciences
ph. 701-777-2245
brooke.solberg@med.und.edu

From: Michael Hamann <MHamann@bemidjistate.edu>
Sent: Monday, January 29, 2018 11:39 AM
To: Paur, Ruth
Subject: MLS course changes

Hi Ruth,

I’m finally sending on the affiliation agreement for signatures. I’ve been sitting on this one a bit as we just completed a curriculum proposal for a Biochemistry, Cell, and Molecular Biology major here at BSU. I’d like to make a few changes to the MLS courses here for consistency with some of the course changes that will be happening with the new major. Please keep in mind that I have the headache of trying to make a Minnesota State requirement to make the program happen within a 120 credit limit (including summer internship credits with you). I’m at the limit currently, and the changes I’m thinking about are to be credit neutral overall.

So here are some changes to the program I’m thinking about on our end:
Instead of a two semester general biology requirement, I’d like to change it to just the first semester which is more cell/molecular. The 2nd semester is more ecology and environment (although there’s some taxonomy). I need to check with a couple of people on our end to see if this is OK with them, but wanted to get your opinion too.

We’re splitting our A&P into two 4 credit courses (Human Anatomy in the fall Human Physiology in the spring) We had this as a 5 credit combo. class taught for just one semester. Is it OK if students just take the Physiology and not the Anatomy? I think I asked you about this previously and you had mentioned the anatomy wasn’t so critical.

We’re also making some smaller changes to our genetics/molecular genetics courses, but I don’t think those will change much of anything on your end.

Part of my goal (especially knocking out the gen bio II) is to make room within the program for students to be required to take a clinical microbiology course that our microbiologist will be teaching more regularly.

Let me know how this seems to work for you.
Hope everything else is going fantastic!
Mike

Michael Hamann, Ph.D.
Biology Department
Bemidji State University
1500 Birchmont Dr. NE, Box 27
Bemidji, MN 56601

Office: Sattgast Hall, 218M
Email: mhamann@bemidjistate.edu
Phone: (218) 755-2798
BSU Curriculum Forms

Form 5

Program Modification Form

Program to be modified: Medical Laboratory Science B.S. major 4+1 option

List all proposed change(s):
- Drop BIOL 2110 Human Anatomy and Physiology (5 cr) and replace with BIOL 3260 Human Physiology (4 cr)
- Drop BIOL 3380 Molecular Genetics: Theory and Practice (4 cr)
- Add BIOL 4715 Clinical Microbiology (3 cr)
- Add BCMB/BIOL 3074 Molecular Techniques (2 credits)
- Reduce BIOL 3580 Immunology from 4 cr to 3 cr
- Changes have also been made to the text of the program description for greater clarity.

Reason(s) for the change(s):
- Changes are required for consistency with course modifications and changes that are occurring as part of the implementation of a BCMB major.
- Changes are also being made to better prepare students for their clinical year coursework. Specifically, the addition of the Clinical Microbiology course and the Molecular Techniques course should greatly enhance student preparedness for the advanced clinical year coursework.

Note: In order to avoid hidden prerequisites, if a course is being dropped from this program (but not from the entire curriculum), please check for which remaining courses may include this dropped course as a prerequisite. Course prerequisites may be found in the online catalog (http://www.bemidjiestate.edu/academics/catalog/). Remedies for hidden prerequisites may be found under Curriculum Forms at (http://www.bemidjiestate.edu/faculty_staff/faculty_association/forms/).

Note: If a course from another department/program was either added to or dropped from this program, please notify the chair/coordinator of that course's department/program and indicate the following:
The course’s home department/program was notified of the addition or dropping of their course(s) on _______ (date) by ________________ (mail, email, or phone).

Please check one of the items below:
- ______ No comments were received from other programs or departments within one week of the notification.
- ______ Comments were received within one week of the notification, and are attached.
Note: If this is a joint program, the signatures of both department chairs (and both deans, if different colleges) must be provided.

PLEASE NOTE FOR THIS PROGRAM: MLS at BSU is a program that is run in affiliation with the UND MLS program. Students are required to take liberal education courses and some advanced biology/chemistry courses here at BSU before applying to the UND portion of the program. Students ultimately are awarded an MLS degree through the BSU Biology Department (CAS) after they complete 37 credits of coursework through the UND program. Changes that are proposed within this BSU major, however, have been approved by UND as well (see email correspondence at the end of the form).

Alert: Attach a copy of the current program showing the marked changes. Please copy the current program from the online catalog (http://www.bemidjistate.edu/academics/catalog/) and paste it into Word. Then use either the Track Changes feature under Tools, or the underline and strikethrough Font feature under Format. (Please note that the Track Changes feature may be easily switched on and off by holding down the Ctrl+Shift+E keys.)
Medical Laboratory Science, B.S. major

Required Credits: 108
Required GPA: 2.25 (Required for graduation from BSU—please see information below regarding GPA requirements for the MLS 4+1 program)

REQUIRED CLINICAL STUDIES 4 + 1 OPTION

NOTE: After completing the clinical year courses, students will receive a double major: Biology, B.S. and Medical Laboratory Science, B.S. In this option, the student completes a Biology, B.S., major at Bemidji State University, and then applies for admission to the clinical year program through the University of North Dakota or other affiliated institution. Be aware that a 2.80 GPA overall and in science courses is one requirement for entrance into the clinical year program. This option may be of interest to students considering a pre-professional program such as pre-medicine, pre-physician’s assistant, pre-veterinary medicine, or other pre-professional area. Students who fail to gain admission to the professional school of their choice will have the option of pursuing a health-related career in Medical Laboratory Science but also gain clinical hours and experience that can facilitate admission to pre-professional programs.

I REQUIRED BIOLOGY COURSES

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2140 Human Anatomy and Physiology (5 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 2620 Introductory Microbiology (4 credits)
- BIOL 3074 Molecular Techniques (2 credits)
  or BCMB 3074 Molecular Techniques (2 credits)
- BIOL 3260 Human Physiology (4 credits)
- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3380 Molecular Genetics: Theory and Practice (4 credits)
- BIOL 3580 Immunology (4 to 3 credits)
- BIOL 3710 Microbiology (4 credits)
- BIOL 4210 Parasitology (4 credits)
- BIOL 4715 Clinical Microbiology (3 credits)

II CAPSTONE PROJECT

II CAPSTONE PROJECT The Biology capstone project, completed in the senior year, provides a culminating experience that integrates the knowledge and skills learned in previous courses and applies them to a scholarly activity. Examples of capstone projects may include original research projects, internships with state or federal agencies, shadowing experiences with professionals, or successfully passing professional/graduate school entrance exams. The capstone project must be designed or chosen by the student in consultation with a faculty mentor or advisor, who must approve the project before work begins. Students should consult with their faculty mentor or advisor before their senior year commences. All capstone projects will include a written and oral component (except for professional/graduate school entrance exams).
PLEASE NOTE: For students admitted to a clinical year program, the required clinical studies (see Section IV below) can be used to satisfy the Capstone Project requirement.

Alternatively, the capstone project may be completed in one of the following ways (0-4 credits):

1. Students using a professional or graduate entrance exam as their capstone project must register for this course. Students must place in at least the 60th percentile on their exam to successfully complete this course.
   - BIOL 4800 Advanced Project Certification (0 credit)

2. Complete BIOL 4894 OR BIOL 4895 (2 credits):
   - BIOL 4894 Advanced Research Project I (2 credits)
   - BIOL 4895 Advanced Research Project II (2 credits)

3. Complete BIOL 4894 and BIOL 4895 (2 credits each):
   - BIOL 4894 Advanced Research Project I (2 credits)
   - BIOL 4895 Advanced Research Project II (2 credits)

III REQUIRED COURSES IN RELATED FIELDS

COMPLETE THE FOLLOWING COURSES:

- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- CHEM 3311 Organic Chemistry I (3 credits)
- CHEM 3312 Organic Chemistry II (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)
- CHEM 3372 Organic Chemistry Laboratory II (1 credit)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)

- PHYS 1101 General Physics I (4 credits)
  or PHYS 2101 Physics I (5 credits)
- PHYS 1102 General Physics II (4 credits)
  or PHYS 2102 Physics II (5 credits)

- STAT 2610 Applied Statistics (4 credits)
  or PSY 3401 Basic Statistics for Research (4 credits)

IV REQUIRED CLINICAL STUDIES
Clinical year courses, taken after the senior year beginning with summer term, are taken through entrance into the clinical year program at the University of North Dakota or at affiliated hospitals. The clinical year will consist of at least 37 credits.

NOTE: A clinical year position is not guaranteed. Students must apply for a clinical year position in October of the junior year. Please see advisor regarding the clinical year of study.
Clean copy of Medical Laboratory Science, B.S. major 4+1 option

Medical Laboratory Science, B.S. major

Required Credits: 108

Required GPA: 2.25 (Required for graduation from BSU—please see information below regarding GPA requirements for the MLS 4+1 program)

REQUIRED CLINICAL STUDIES 4 + 1 OPTION

NOTE: After completing the clinical year courses, students will receive a double major: Biology, B.S. and Medical Laboratory Science, B.S. In this option, the student completes a Biology, B.S., major at Bemidji State University, and then applies for admission to the clinical year program through the University of North Dakota or other affiliated institution. Be aware that a 2.80 GPA in science courses is one requirement for entrance into the clinical year program.

This option may be of interest to students considering a pre-professional program such as pre-medicine, pre-physician's assistant, or other pre-professional area. Students have the option of pursuing a health-related career in Medical Laboratory Science but also gain clinical hours and experience that can facilitate admission to pre-professional programs

I REQUIRED BIOLOGY COURSES

- BIOL 1211 Introductory Biology I (4 credits)
- BIOL 1212 Introductory Biology II (4 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 2610 General Ecology (3 credits)
- BIOL 3074 Molecular Techniques (2 credits) or BCMB 3074 Molecular Techniques (2 credits)
- BIOL 3260 Human Physiology (4 credits)
- BIOL 3300 Introduction to Hematology (4 credits)
- BIOL 3580 Immunology (3 credits)
- BIOL 3710 Microbiology (4 credits)
- BIOL 4210 Parasitology (4 credits)
- BIOL 4715 Clinical Microbiology (3 credits)

II CAPSTONE PROJECT

II CAPSTONE PROJECT The Biology capstone project, completed in the senior year, provides a culminating experience that integrates the knowledge and skills learned in previous courses and applies them to a scholarly activity. Examples of capstone projects may include original research projects, internships with state or federal agencies, shadowing experiences with professionals, or successfully passing professional/graduate school entrance exams. The capstone project must be designed or chosen by the student in consultation with a faculty mentor or advisor, who must approve the project before work begins. Students should consult with their faculty mentor or advisor before their senior
year commences. All capstone projects will include a written and oral component (except for professional/graduate school entrance exams).

PLEASE NOTE: For students admitted to a clinical year program, the required clinical studies (see Section IV below) can be used to satisfy the Capstone Project requirement.

Alternatively, the capstone project may be completed in one of the following ways (0-4 credits):

1. Students using a professional or graduate entrance exam as their capstone project must register for this course. Students must place in at least the 60th percentile on their exam to successfully complete this course.
   - BIOL 4800 Advanced Project Certification (0 credit)

2. Complete BIOL 4894 OR BIOL 4895 (2 credits):
   - BIOL 4894 Advanced Research Project I (2 credits)
   - BIOL 4895 Advanced Research Project II (2 credits)

3. Complete BIOL 4894 and BIOL 4895 (2 credits each):
   - BIOL 4894 Advanced Research Project I (2 credits)
   - BIOL 4895 Advanced Research Project II (2 credits)

III REQUIRED COURSES IN RELATED FIELDS

COMPLETE THE FOLLOWING COURSES:

- CHEM 2211 Principles of Chemistry I (4 credits)
- CHEM 2212 Principles of Chemistry II (4 credits)
- CHEM 3311 Organic Chemistry I (3 credits)
- CHEM 3312 Organic Chemistry II (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)
- CHEM 3372 Organic Chemistry Laboratory II (1 credit)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)

- PHYS 1101 General Physics I (4 credits)
  or PHYS 2101 Physics I (5 credits)
- PHYS 1102 General Physics II (4 credits)
  or PHYS 2102 Physics II (5 credits)
• STAT 2610 Applied Statistics (4 credits)
or PSY 3401 Basic Statistics for Research (4 credits)

IV REQUIRED CLINICAL STUDIES

Clinical year courses, taken after the senior year beginning with summer term, are taken through entrance into the clinical year program at the University of North Dakota or at affiliated hospitals. The clinical year will consist of at least 37 credits.

NOTE: A clinical year position is not guaranteed. Students must apply for a clinical year position in October of the junior year. Please see advisor regarding the clinical year of study
I was actually able to talk with advisors this morning, and we all agreed that the changes you are proposing below will work for our program requirements! Thanks again for your work on this.

Brooke Solberg, PhD, MLS(ASCP)CM
Associate Professor & Chair – Dept. of Medical Laboratory Science
UND School of Medicine and Health Sciences
ph. 701-777-2245
brooke.solberg@med.und.edu

From: Paur, Ruth
Sent: Wednesday, February 07, 2018 8:44 AM
To: Solberg, Brooke <brooke.solberg.1@med.und.edu>
Subject: Fw: MLS course changes

Hi Mike!

I have taken over for Ruth (or at least trying to!), as she retired in December. I will take a look at the changes proposed below and run them through our advisors, and hopefully get back to you early next week. I also hope to get a message out to all WCAMLS advisors just to introduce myself and get feedback. Thanks for working on the agreement and the curriculum!

Brooke Solberg, PhD, MLS(ASCP)CM
Associate Professor & Chair – Dept. of Medical Laboratory Science
UND School of Medicine and Health Sciences
ph. 701-777-2245
brooke.solberg@med.und.edu

From: Michael Hamann <MHamann@bemidjistate.edu>
Sent: Monday, January 29, 2018 11:39 AM
To: Paur, Ruth
Subject: MLS course changes

Hi Ruth,

I’m finally sending on the affiliation agreement for signatures. I’ve been sitting on this one a bit as we just completed a curriculum proposal for a Biochemistry, Cell, and Molecular Biology major here at BSU. I’d like to make a few changes to the MLS courses here for consistency with some of the course changes that will be happening with the new major. Please keep in mind that I have the headache of trying to make a Minnesota State requirement to make the program happen within a 120 credit limit (including summer internship credits with you). I’m at the limit currently, and the changes I’m thinking about are to be credit neutral overall.

So here are some changes to the program I’m thinking about on our end:
Instead of a two semester general biology requirement, I’d like to change it to just the first semester which is more cell/molecular. The 2nd semester is more ecology and environment (although there’s some taxonomy). I need to check with a couple of people on our end to see if this is OK with them, but wanted to get your opinion too.

We’re splitting our A&P into two 4 credit courses (Human Anatomy in the fall Human Physiology in the spring) We had this as a 5 credit combo. class taught for just one semester. Is it OK if students just take the Physiology and not the Anatomy? I think I asked you about this previously and you had mentioned the anatomy wasn’t so critical.

We’re also making some smaller changes to our genetics/molecular genetics courses, but I don’t think those will change much of anything on your end.

Part of my goal (especially knocking out the gen bio II) is to make room within the program for students to be required to take a clinical microbiology course that our microbiologist will be teaching more regularly.

Let me know how this seems to work for you.
Hope everything else is going fantastic!
Mike

Michael Hamann, Ph.D.
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BSU Curriculum Forms

Form 8
Updated: 09.18.15

Signatures

Dr. Mark Wallert / Associate Professor / Biology / 11/14/17
Proposer / Title / Date

Dr. Michael Hamann / Professor / Biology / 11/14/17
Proposer / Title / Date

Dr. Holly LaFerriere / Assistant Professor / Biology / 11/16/17
Proposer / Title / Date

Dr. Kenneth Traxler / Professor / Chemistry / 11/14/17
Proposer / Title / Date

Dr. Katie Peterson / Assistant Professor / Chemistry / 11/14/17
Proposer / Title / Date

Dr. Elizabeth Rave / Chair / Department of Biology / 11/17/17
Chair or Director / Department or Program / Date

Dr. Keith Marek / Chair / Department of Chemistry / 11/14/17
Chair or Director / Department or Program / Date

Note: "All departmental recommendations [on curriculum] must be reviewed and approved by the department's faculty."--IFO/MnSCU Master Agreement 2009-2011, 20.A.3 (p. 80).

At this point, packet goes to Records Office/Curriculum Coordinator to be logged in to the Curriculum Proposal Progress Grid.

Dr. Colleen Greer / College of Arts and Sciences / 12/5/17
Dean / College / Date

Note: If proposal is sent back to the Proposer, please notify the Curriculum Coordinator. If approved, packet goes to Academic Affairs Office.