Michael Kahn has submitted a request for a major curricular change. His/her email address is: kahn@wsu.edu.

**Requested change:** Revise or Drop Graduate Certificate

**Title:** Protein Biotechnology

**Requested Effective Date:** Fall 2018

**Revise certificate requirement:** Yes

**Dean:** Slinker, Bryan - Dean - Vet Med Grad, Andefsky, Bill - Dean - MSE Graduate

**Chair:** Jones, Jonathan,
Jones, Jonathan,

Slinker, Bryan - Dean - Vet Med Grad,

Michael Kahn has submitted a request for a major curricular change.

Requested change: Revise or Drop Graduate Certificate

Title: Protein Biotechnology

Requested Effective Date: Fall 2018

Revise certificate requirement: Yes

Both Chair and Dean approval is required to complete the submission process. Please indicate that you have reviewed the proposal by highlighting one of the statements below and reply all to this email. (curriculum.submit@wsu.edu)

[Details of major change requested can be found in the attached supplemental documentation]

1. I approve this proposal in its current form.

2. I approve this proposal with revisions. Revisions are attached.

3. I do not approve this proposal. Please return to submitter.

If you do not respond within one week, you will be sent a reminder email. If no response is received within three weeks of the submission date, the proposal will be returned to the submitter.

Thank you for your assistance as we embark on this new process. If you have any questions or concerns, please let us know wsu.curriculum@wsu.edu.
Suzanne Lambeth, Assistant Registrar
Graduations, Curriculum, & Scheduling
Washington State University
Registrar's Office
PO Box 641035
Pullman WA 99164-1035
509-335-7905
slambeth@wsu.edu

Note: Please use the attachments to this email rather than the link below to view the supporting documentation.
From: Slinker, Bryan
To: Jones, Jonathan C; curriculum.submit
Subject: RE: 370946 Molecular Biosciences Requirements Revise - Revise or Drop Graduate Certificate
Date: Wednesday, July 26, 2017 12:44:22 PM

Approved

Bryan Slinker

From: Jones, Jonathan C
Sent: Wednesday, July 26, 2017 12:37 PM
To: curriculum.submit <curriculum.submit@wsu.edu>; Slinker, Bryan <slinker@vetmed.wsu.edu>
Subject: RE: 370946 Molecular Biosciences Requirements Revise - Revise or Drop Graduate Certificate

Approved

Jonathan Jones

From: curriculum.submit@wsu.edu [mailto:curriculum.submit@wsu.edu]
Sent: Wednesday, July 26, 2017 12:16 PM
To: Jones, Jonathan C <jcr.jones@vetmed.wsu.edu>; Slinker, Bryan <slinker@vetmed.wsu.edu>
Subject: 370946 Molecular Biosciences Requirements Revise - Revise or Drop Graduate Certificate

Jones, Jonathan,

Slinker, Bryan - Dean - Vet Med Grad,

Michael Kahn has submitted a request for a major curricular change.

Requested change: Revise or Drop Graduate Certificate

Title: Protein Biotechnology

Requested Effective Date: Fall 2018

Revise certificate requirement: Yes

Both Chair and Dean approval is required to complete the submission process. Please indicate that you have reviewed the proposal by highlighting one of the statements below and reply all to this email. (curriculum.submit@wsu.edu)

[Details of major change requested can be found in the attached supplemental documentation]

1. I approve this proposal in its current form.
2. I approve this proposal with revisions. Revisions are attached.

3. I do not approve this proposal. Please return to submitter.

If you do not respond within one week, you will be sent a reminder email. If no response is received within three weeks of the submission date, the proposal will be returned to the submitter.

Thank you for your assistance as we embark on this new process. If you have any questions or concerns, please let us know wsu.curriculum@wsu.edu.

Suzanne Lambeth, Assistant Registrar
Graduations, Curriculum, & Scheduling
Washington State University
Registrar's Office
PO Box 641035
Pullman WA 99164-1035
509-335-7905
slambeth@wsu.edu

Note: Please use the attachments to this email rather than the link below to view the supporting documentation.
We request that BE 550, Cellular Bioengineering, be added to the list of electives that can be used to satisfy the elective requirement of the Graduate Certificate in Protein Biotechnology. The current syllabus for BE 550 is attached.

The Certificate was established in order to help graduate students document their training in aspects of Protein Biotechnology. Adding Cellular Bioengineering, which deals with aspects of cell biology from an engineering perspective, is an appropriate disciplinary fit to the Certificate. As in the past, consideration of this addition has been approved by the Executive Steering Committee of the Protein Biotechnology Training Program, which has representatives from all of the participating departments. The routing for Certificate will pass through the School of Molecular Biosciences, one of the academic units associated with this interdisciplinary program, which is in the College of Veterinary Medicine. The Certificate requirements can be met by students in the Protein Biotechnology Training Program or by any other student who meets the requirements detailed on the next page.

Michael L. Kahn  
Professor, Institute of Biological Chemistry  
Director, NIH Protein Biotechnology Training Program  
Washington State University  
203 Clark Hall, P.O. Box 646340  
Pullman, WA  99164-6340  
509-335-8327 * Fax: 509-335-7643
Graduate Certificate in Protein Biotechnology

1. **Credit Hours: 12 credit hours total**

2. **Required Courses: must complete all of the following**
   a. MBIOS 513 (General Biochemistry I)
   b. MBIOS 574 (Protein Biotechnology)
      i. Course is cross-listed as CH_E 574
   c. PHIL 530 (Bioethics)

3. **Elective Courses: must complete at least one of the following as a graduate student:**
   a. BIO ENGR 550
   b. CH_E 560
   c. CH_E 581
   d. CHEM 514
   e. CHEM 543
   f. CHEM 544
   g. E_MIC 586 and E_MIC 587
   h. HORT 518
   i. MBIOS 503
   j. MBIOS 514
   k. MBIOS 540
   l. MBIOS 542
   m. MBIOS 564 (3 credits)
   n. MBIOS 566
   o. MBIOS 578
   p. MPS 525
   q. PLP 535
   r. VET_PH 505
   s. VET_PH 555

4. **GPA requirement: Cumulative GPA may not fall below a 3.0**
BE 550 - Cellular Bioengineering

Introduction: This course fits well as an elective course of NIH training program because as shown in its content descriptions, the course is uniquely designed to bridge cell biology with engineering. It enable students to apply engineering principles to problems in cellular and molecular biology. The class will allow students from both engineering side and biology side to interact and learn each other. It is expected that students from engineering fields will be able to get insight of biological systems, while the students from the biology side will learn to view biological system from engineering point of view and acquire skills to enhance their capability for quantitative analysis of complex biological system.

Credits and contact hours: 3 credit hours,

Offered: Fall Semester

Lecture: MWF 1:10 – 2:00 p.m. Wegner G70.

Instructors:
Wen-Ji Dong, Ph.D., VBR 271/Wegner 109; Tel: (509) 335-5798, E-mail: wdong@vetmed.wsu.edu

Courses that require this as a prerequisite: None

Text/other required material:
A handout developed by instructors is available at Cougar Copies located in the CUB. The handout will be used as our main reference for the class.

Suggested reference books are:
2. S. Cortassa et al. An introduction to metabolic and cellular engineering, ISBN 981-02-4835-0

Specific goals for the course:
Specific outcomes of instruction:
At the completion of this course, students should be able to:
1. Discuss the molecular and cellular basis of life from an engineering perspective
2. Identify crucial molecular parameters involved in cellular events
3. Measure and manipulate molecular parameters experimentally
4. Apply engineering principles, concepts, and mathematical modeling in studying molecular parameters, cell structure, function, and appropriately capture the salient features of the cellular phenomena and manipulate the behavior of biological cells
5. Examine cell-function relationship and cell-biomaterials relationship
6. Incorporate the thermodynamics and kinetics of protein/ligand binding, with an emphasis on experimental techniques for measuring molecular parameters such as equilibrium affinities, kinetic rate constants, and diffusion coefficients
7. Explore, and criticize the existing and emerging technologies that exploit our knowledge of molecular and cell biology

Attendance
You are expected to attend all class periods. If you have to miss a class, please inform the instructor in advance.

Class structure

Lectures: the three hours of lectures will be used to discuss different subjects of cellular biology from an engineering perspective, solve problems associated with cellular engineering, and explore technologies related to materials covered. Each week, you will be required to summarize or criticize an article from the literature on material relevant to that covered in the week.

Project description, deadlines, and presentation

Each student is required to submit a review article by the end of the semester. The subject of the review article will be left to student to choose; however, should be closely related to class material. If you prefer the instructor to assign you a topic, let us know. We suggest that you write the review on your own research subject. The review article should be 10 pages, double spaced, 12 points Times New Roman font. The article should provide a thorough literature review and should cover when possible modeling aspects, new innovations and related technologies, current state, future perspectives, most common experimental techniques, and anything else of relevance. The review article should summarize at least 10 references of importance in the field. The references should be cited according to American Chemical Society style for references.

Deadlines

Review abstract with 3 references minimum is due on third week of September
First draft (should be as complete as possible) due on End of October
Final draft is due one day before your presentation on Last week of the class
Presentation on Last week of the class

Presentations

Each student will present a 20 minute presentation to the class. The presentation will be followed by a 5 minute discussion. Presentations should be in power point and should be professional. Guidelines will be given.

Grading

Homework assignments 10%, project paper and presentation 10%, lab reports 10%, weekly reading assignments, 10%, midterm exam 30% and final exam: 30%. In class activities and quizzes will be graded as a bonus.

Grades will follow the following structure: 93-100 A, 90-92 A-, 85-89 B+, 80-84 B, 75-79 B-, 70-74 C+, 65-69 C, 60-64 C-, 55-59 D+, 50-54 D, below 50 will get an F.

Homework assignments

Homework assignments will be given weekly to help you master the principles we cover in class. Solution of homework problems are due at 9:10 a.m. at the due date specified on the homework. No late homework will be accepted. Only individual assignments will be given. On individual assignments, group discussions are encouraged; however, copied assignments are not acceptable. There must be a clear presentation of the problem and a solution understandable by another engineer including:

| 1) Problem statement with a diagram | 4) Answers underlined with appropriate units |
| 2) Approaches and equations used | 5) A discussion of implications of the answer |
| 3) Values with units used for the solution | 6) Computer graphics, linear regressions, etc. |

Weekly reading assignments

Each week, you will be given few articles to read. Sometimes you will be required to summarize your article and sometimes you will be required to criticize the article. When you summarize the article, you will write the
summary from the authors’ point of view while when you criticize the article; you will write your critique from the scientific community point of view. Expected to attend all class periods. If you have to miss a class, please inform the instructor in advance.

Brief list of topics covered:
Introduction to cellular engineering, introduction to cell, types of bioreactors, bioreactor design, review of kinetics, mass balance for batch, semi-batch and continuous bioreactors, washout and dilution rates, bioreactor design and scale up, cellular metabolism, cellular thermodynamics, transport across cellular membrane, transport in saturated porous media, energies of transport, osmosis, 1-D transport across tissues, cellular adhesion, measurements, forces and modeling, cellular mechanics, basics of cell communication, properties of signaling molecules and cell surface receptors, G-protein linked receptor, enzyme-linked receptor & model analysis, introduction of ion channels, signal transduction, introduction of genetic engineering, transgenic animals, advancements in plant technology, pharmaceutical biotechnology, drug delivery system, stem cells and tissue engineering.

Criteria for student evaluation and course specific grading scale:
Homework assignments 20%, midterm exam 40% and final exam 40%. Grades will follow the following structure: 93-100 A, 90-92 A-, 85-89 B+, 80-84 B, 75-79 B-, 70-74 C+, 65-69 C, 60-64 C-, 55-59 D+, 50-54 D, below 50 will get an F.

Homework assignments: Homework assignments will be given weekly to help you master the principles we cover in class. Solution of homework problems are due at 1:10 p.m. at the due date specified on the homework. No late homework will be accepted.

Disability statement
Students with Disabilities: Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with Access Advisor. All accommodations MUST be approved through the Access Center.

Plagiarism and cheating
Academic integrity will be strongly enforced in this course. All information from outside sources shall be properly cited. Failure to do so will be considered plagiarism. Cases of plagiarism and cheating will result in a grade of “0” for that assignment. Cheating includes, but is not limited to, plagiarism and unauthorized collaboration as defined in the Standards of Conduct for Students, WAC 504-26-010(3). You need to read and understand all of the definitions of cheating: http://app.leg.wa.gov/WAC/default.aspx?cite=504-26-010. If you have any questions about what is and not allowed in this course, you should ask course instructors before proceeding. If you wish to appeal a faculty member's decision relating to academic integrity, please use the form available at conduct.wsu.edu

Safety
Classroom and campus safety are of paramount importance at Washington State University, and are the shared responsibility of the entire campus population. WSU urges students to follow the “Alert, Assess, Act” protocol for all types of emergencies and the “Run, Hide, Fight” response for an active shooter incident. Remain ALERT (through direct observation or emergency notification), ASSESS your specific situation, and ACT in the most appropriate way to assure your own safety (and the safety of others if you are able).

Campus Resources
Campus resources available to you include the Writing Center, Library Services, Center for Advising and Career Development and the Access Center.
**Course content**

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture #</th>
<th>Lecture Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/22</td>
<td>1</td>
<td>Introduction to cellular engineering.</td>
</tr>
<tr>
<td>8/24</td>
<td>2</td>
<td>Introduction to cell (organelles).</td>
</tr>
<tr>
<td>8/26</td>
<td>3</td>
<td>Cell processes.</td>
</tr>
<tr>
<td>8/29</td>
<td>4</td>
<td>Bioreactors.</td>
</tr>
<tr>
<td>9/2</td>
<td>6</td>
<td>Mass balance for bioreactors.</td>
</tr>
<tr>
<td>9/5</td>
<td>Off</td>
<td>Labor Day (All University Holiday)</td>
</tr>
<tr>
<td>9/7</td>
<td>7</td>
<td>Washout and dilution rates.</td>
</tr>
<tr>
<td>9/9</td>
<td>8</td>
<td>Guest lecture: Centrifugal Bioreactor.</td>
</tr>
<tr>
<td>9/12</td>
<td>9</td>
<td>Use of bioreactors.</td>
</tr>
<tr>
<td>9/14</td>
<td>10</td>
<td>Cellular metabolism.</td>
</tr>
<tr>
<td>9/16</td>
<td>11</td>
<td>Cellular thermodynamics.</td>
</tr>
<tr>
<td>9/19</td>
<td>12</td>
<td>Cellular thermodynamics (cont)</td>
</tr>
<tr>
<td>9/21</td>
<td>13</td>
<td>Cellular membranes.</td>
</tr>
<tr>
<td>9/23</td>
<td>14</td>
<td>Ion channels.</td>
</tr>
<tr>
<td>9/26</td>
<td>15</td>
<td>Diffusion.</td>
</tr>
<tr>
<td>9/28</td>
<td>16</td>
<td>Transport across cellular membrane</td>
</tr>
<tr>
<td>9/30</td>
<td>17</td>
<td>Transport in porous media.</td>
</tr>
<tr>
<td>10/3</td>
<td>18</td>
<td>Cellular adhesion.</td>
</tr>
<tr>
<td>10/5</td>
<td>19</td>
<td>Adhesion measurements.</td>
</tr>
<tr>
<td>10/7</td>
<td>20</td>
<td>Guest lecture: Forces and models of cellular adhesion.</td>
</tr>
<tr>
<td>10/10</td>
<td>21</td>
<td>Cell mechanics.</td>
</tr>
<tr>
<td>10/12</td>
<td>22</td>
<td>Exam review</td>
</tr>
<tr>
<td><strong>10/14</strong></td>
<td><strong>23</strong></td>
<td>Midterm exam</td>
</tr>
<tr>
<td>10/17</td>
<td>24</td>
<td>Basics of Cell Communication/Introduction</td>
</tr>
<tr>
<td>10/19</td>
<td>25</td>
<td>Properties of Signaling Molecules and Cell Surface Receptors</td>
</tr>
<tr>
<td>10/21</td>
<td>26</td>
<td>G-protein Linked Receptor</td>
</tr>
<tr>
<td>10/24</td>
<td>27</td>
<td>Model Analysis</td>
</tr>
<tr>
<td>10/26</td>
<td>28</td>
<td>Enzyme-Linked Receptor</td>
</tr>
<tr>
<td>10/28</td>
<td>29</td>
<td>Theoretical Background of Enzyme Kinetics</td>
</tr>
<tr>
<td>10/31</td>
<td>30</td>
<td>Model Analysis</td>
</tr>
<tr>
<td>11/2</td>
<td>31</td>
<td>Signal Transduction through Ion Channels</td>
</tr>
<tr>
<td>11/4</td>
<td>32</td>
<td>Equivalent Circuit Model and Action Potential</td>
</tr>
<tr>
<td>11/7</td>
<td>33</td>
<td>Introduction of Genetic Engineering and Biotechnology</td>
</tr>
<tr>
<td>11/9</td>
<td>34</td>
<td>Forensic Applications; Protein Engineering and application</td>
</tr>
<tr>
<td><strong>11/11</strong></td>
<td><strong>off</strong></td>
<td>Veterans Day</td>
</tr>
<tr>
<td>11/14</td>
<td>35</td>
<td>Optogenetics and application</td>
</tr>
<tr>
<td>11/16</td>
<td>36</td>
<td>Biomedical Applications and molecular Diagnostics</td>
</tr>
<tr>
<td>11/18</td>
<td>37</td>
<td>Gene Therapy</td>
</tr>
<tr>
<td><strong>11/21</strong></td>
<td><strong>Off</strong></td>
<td>Thanksgiving Vacation begins</td>
</tr>
<tr>
<td><strong>11/23</strong></td>
<td><strong>Off</strong></td>
<td>Thanksgiving Vacation continues</td>
</tr>
<tr>
<td><strong>11/25</strong></td>
<td><strong>Off</strong></td>
<td>Thanksgiving Vacation ends</td>
</tr>
<tr>
<td>11/28</td>
<td>38</td>
<td>Transgenic Animal, Animal Cloning and Applications</td>
</tr>
<tr>
<td>11/30</td>
<td>39</td>
<td>Epigenetics</td>
</tr>
<tr>
<td>12/2</td>
<td>40</td>
<td>Transgenic Plants and Applications</td>
</tr>
<tr>
<td>12/5</td>
<td>41</td>
<td>Stem Cells</td>
</tr>
<tr>
<td>12/7</td>
<td>42</td>
<td>Tissue Engineering</td>
</tr>
<tr>
<td>12/9</td>
<td>43</td>
<td>Review for the final exam</td>
</tr>
<tr>
<td><strong>12/12</strong></td>
<td><strong>44</strong></td>
<td>Final Exam</td>
</tr>
</tbody>
</table>
Correct. They were electives back in the mid 2000s before there were 500 level options available for the engineers.

Susan

----- Original message-----
From: curriculum.submit
Date: Mon., 28 Aug. 2017 10:05 am
To: Cao, Susan;
Cc: Kahn, Michael L;
Subject: FW: 080 RE: 370946 Molecular Biosciences Requirements Revise - Revise or Drop Graduate Certificate

Susan,

Just so that I am clear on this – CHE 475 and 476 are not approved electives?

Suzanne

From: Cao, Susan
Sent: Friday, August 25, 2017 1:42 PM
To: curriculum.submit <curriculum.submit@wsu.edu>
Cc: Kahn, Michael L <kahn@wsu.edu>
Subject: 080 RE: 370946 Molecular Biosciences Requirements Revise - Revise or Drop Graduate Certificate

Suzanne,

That list you have isn’t up to date from the last iteration I did with Deb Cruz in the Graduate School several years ago before it was decided that all changes to our certificate requirements and electives would have to be done as curricular change requests.

The new list (adding the new BIO ENGR 550 course, dropping MBIOS 504, and replacing MBIOS 508 with MBIOS 564) should now look like this:

Washington State University NIH Program in Biotechnology
Emphasis on Protein Chemistry

GUIDELINES FOR COURSEWORK

Required Courses

1. **Protein Biotechnology** (MBIOS 574 or Ch E 574 - 3 cr.) Alternate spring semesters, taken in spring of year 1 or 2. Created for our Training Program, this course is organized around the development of interdisciplinary biotechnology proposals by teams of students with varied backgrounds. Selected Training faculty and invited guest speakers from academia and industry lecture on their specialties.
2. **General Biochemistry I (MBIOS 513 - 3 cr.)** Fall semesters, usually taken in fall of year 1. Structure and organization of proteins and nucleic acids; protein folding; fundamental principles of enzymology; lipids, membranes and polysaccharides; experimental techniques and strategies. Trainees with engineering or non-biological science can take MBioS 303 Introductory Biochemistry (4 cr.) and then, as appropriate, MBioS 513.

3. **Bioethics (PHIL 530 - 2 cr.)** Fall semesters. A centralized campus-wide bioethics course that is team taught by experts in relevant scientific fields. The areas covered in the course include: Ethical Theory and Reasoning; Responsible Conduct of Research; Ethical Issue in Publishing/Intellectual Property/Biotechnology Product Development; Bioethics Regarding: Genetically Modified Organisms, Advanced Reproductive Technologies (i.e., cloning), Animal and Human Research Use Issues and Biotechnology Advances.

**Plus elective courses** from the following list:

1. **Cellular Bioengineering (BIO_ENGR 550 – 3 cr.)** Cellular biology integrated with engineering science; cellular phenomena from an engineering perspective; quantitative engineering principles for cellular-based materials, diagnostic devise and sensor designs. Typically offered Fall.

2. **Biochemical Engineering (CH_E 560 – 3 cr.)** Chemical engineering applied to biological systems; fermentation processes, biochemical reactor design, downstream processing, transport phenomena in biological systems, biochemical technology. Typically offered Spring.

3. **Biofilms (CH_E 581 – 3 cr.)** This class covers medical and environmental biofilms and provides fundamental knowledge needed to understand biofilm processes and biofilm control. This class targets students from life sciences to engineering.

4. **Mass Spectrometry (CHEM 514 – 3 cr.)** Prerequisite, Chem. 425 (Instrumental Analysis) or equivalent. Current methods, techniques and interpretation of mass spectrometric analysis.

5. **Bioorganic and Medicinal Chemistry (CHEM 543 – 3 cr.)** Chemistry of biological systems, medicinal chemistry, protein chemistry, enzyme mechanisms and inhibitors.

6. **Reaction Enzyme Mechanisms (CHEM 544 – 3 cr.)** Advanced Topics in enzymatic reaction mechanisms.

7. **Special Topics and Projects in Electron Microscopy (E MIC 586/587 – 3 cr.)** Practical training in one or more areas of electron microscopy; TEM, SEM, ultramicrotomy, specimen processing; confocal fluorescent microscopy. Note, these courses are taken as a set of lecture/lab. Typically offered Fall and Spring.

8. **Postharvest Biology and Technology (HORT 518 – 3 cr.)** Physical and physiological basis for handling and storage practices; perishable organ ontogeny and physiological disorders; post-harvest environment requirements. Field trip required. Typically offered Fall.

9. **Advanced Molecular Biology (MBIOS 503 – 3 cr.)** DNA replication, gene expression and regulation, including chromatin structure, DNA repair, recombination, genomic editing, and epigenetic regulation. Typically offered Fall.

10. **Quantitative Approaches in Molecular Biosciences (MBIOS 508 – 3 cr.)** This course is on a space available basis only, please check with Dr. Lisa Gloss (lmgloss@wsu.edu)
before registering—Mathematics and statistics as applied in modern molecular biosciences research and developing foundations for collecting and critically analyzing quantitative data.

11. **General Biochemistry II** (MBIOS 514 – 3 cr.) Carbohydrate, amino acid and lipid metabolism and its control; biochemistry of vitamins; bioenergetics; photosynthesis; nitrogen fixation.

12. **Immunology** (MBIOS 540 – 3 cr.) Principles of the immune system at the animal, cellular and molecular levels.

13. **General Virology** (MBIOS 542 – 3 cr.) Graduate level coverage of the structure, function and biology viruses that infect eukaryotic cells and organisms.

14. **Topics in Biomedical Experimentation** (MBIOS 564 – 3 cr. Required) Examination of the philosophy of experimental design and practical application and analysis of various experimental approaches in biomedical research. Recommended preparation: graduate standing in a WSU biomedical-based program, and an advanced undergraduate or graduate statistics course. Typically offered Fall. (Crosslisted course offered as NEUROSCI 564, GLANHLTH 564, MBIOS 564, VET MICR 564, VET PATH 564, VET PH 564).

15. **Physical Biochemistry** (MBIOS 566 – 3 cr.) MBIOS 465 or one year of physical chemistry is a prerequisite. Physical methods for study of structure of proteins and nucleic acids; spectroscopy, magnetic resonance, diffusion and sedimentation, electron microscopy, diffraction and scattering, computer analysis.


17. **Plant Molecular Genetics** (MPS 525 – 3 cr.) Introduction to plant genome organization and gene expression while acquiring knowledge of modern molecular techniques and experimental approaches.

18. **Molecular Genetics of Plant and Pathogen Interactions** (PL P 535 – 3 cr.) Genetic and molecular biological aspects of host-pathogen interactions. Typically offered Even Years - Spring.

19. **Design and Analysis of Biomedical Experiments** (VPH 505 – 3 cr.) Design of experiments with application to clinical and basic biomedical research; choosing, applying, and evaluating appropriate data analysis methods.


---

Susan Cao
Administrator
NIH Biotechnology Training Program at WSU
PO Box 646240
Pullman, WA  99164-6240
From: curriculum.submit
Sent: Friday, August 25, 2017 1:27 PM
To: Cao, Susan <bentjen@wsu.edu>
Subject: RE: 370946 Molecular Biosciences Requirements Revise - Revise or Drop Graduate Certificate

Susan,

I have made the corrections to the submission as requested and have attached it for your review.

Please let me know if you note errors or have questions.

Suzanne

From: Cao, Susan
Sent: Friday, August 25, 2017 1:09 PM
To: curriculum.submit <curriculum.submit@wsu.edu>
Cc: Kahn, Michael L <kahn@wsu.edu>
Subject: RE: 370946 Molecular Biosciences Requirements Revise - Revise or Drop Graduate Certificate

Susan,

After talking with the people in SMB about their recent course reorganizations (see email below from Dr. Kim), we would like to drop the discontinued MBIOS 504 from our elective list since some of the material has been added to MBIOS 503 (already on the elective list).

We would like to add the new replacement course MBIOS 564, but we would require our trainees to take all three credits for it to count as a Biotech elective, in place of MBIOS 508 on our list.

Please let me know if Dr. Kahn or I can be of any more assistance,

Susan

Susan Cao
Administrator
NIH Biotechnology Training Program at WSU
PO Box 646240
Pullman, WA 99164-6240
From: Kim, Kwanhee [mailto:khkim@vetmed.wsu.edu]
Sent: Friday, August 25, 2017 11:55 AM
To: Cao, Susan <bentjen@wsu.edu>
Cc: Watts, Jennifer <jwatts@vetmed.wsu.edu>; T Breske <tbreske@vetmed.wsu.edu>
Subject: Re: MBIOS course changes

Susan,

MBioS 503 and 504 were reorganized and some of the MBioS 504 content was incorporated into the current MBioS 503 called Advanced Molecular Biology (without I). MBioS 504 was dropped. This was approved by the faculty senate.

MBioS 508 has been dropped and has been replaced with MBioS 564 called Biomedical Experimentation for iPBS students (including Molecular Biosciences students). There are three modules for MBioS 564, 1 credit each. Only the first module called Biomedical Experimentation: the Philosophy of Experimental Design (1 credit) is required for iPBS students.

Biomedical Experimentation: Analysis--Biomedical Experiment (1 credit) and Biomedical Experimentation: Imaging (1 credit) are not required, but recommended to iPBS students (including Molecular Biosciences students). MBioS 508 (2 credits) are most similar to the first and second modules.

Kwanhee

Kwanhee Kim, Ph.D.
Professor
School of Molecular Biosciences
Biotechnology Life Sciences Building 345
Washington State University
Pullman, WA 99164-7520
TEL (509) 335-7022
khkim@vetmed.wsu.edu

From: "curriculum.submit" <curriculum.submit@wsu.edu>
Date: Friday, August 25, 2017 at 8:21 AM
To: Michael Kahn <kahn@wsu.edu>
Subject: FW: 370946 Molecular Biosciences Requirements Revise - Revise or Drop Graduate Certificate

Michael,
I've done an initial review of your request to revise the requirements for the Certificate in Protein Biotechnology. You have included two courses on your list of elective courses that were dropped effective Fall 2017. These courses are MBIOS 504 and MBIOS 508. Are there additional courses you wish to add to the list in the place of these two courses or is it ok if I simply remove these two?

Thank you.

Suzanne

Suzanne Lambeth, Assistant Registrar  
Graduations, Curriculum, & Scheduling  
Washington State University  
Registrar's Office  
PO Box 641035  
Pullman WA 99164-1035  
509-335-7905  
slambeth@wsu.edu

This communication may contain privileged, non-public or other confidential information. If you have received it in error, please advise the sender by reply email and immediately delete the message and any attachments without copying or disclosing the contents. Thank you.

IMPORTANT INFORMATION FOR WSU STUDENTS: Per new WSU policy effective August 24, 2015, the “preferred” email address in your myWSU will change to your WSU email address. All correspondence regarding academic and business-related activities will be sent to your WSU e-mail address.

From: noreply@wsu.edu  
Sent: Wednesday, July 26, 2017 12:16 PM  
To: curriculum.submit <curriculum.submit@wsu.edu>  
Subject: 370946 Molecular Biosciences Requirements Revise - Revise or Drop Graduate Certificate

Michael Kahn has submitted a request for a major curricular change. His/her email address is: kahn@wsu.edu.

Requested change: Revise or Drop Graduate Certificate

Title: Protein Biotechnology

Requested Effective Date: Fall 2018

Revise certificate requirement: Yes

Dean: Slinker, Bryan - Dean - Vet Med Grad , Andefsky, Bill - Dean - MSE Graduate
1. Credit Hours: 11 credit hours total

2. Required Courses: must complete all of the following:
   a. MBIOS 513 (General Biochemistry I)
   b. MPS 574 (Protein Biotechnology)
      i. Course is cross-listed as CH_E 574 and MBIOS 574
   c. PHIL 530 (Bioethics)

3. Elective Courses: must complete at least one of the following as a graduate student:
   a. BIO ENGR 550
   b. CH_E 560
   c. CH_E 581 (3 credits)
   d. CHEM 514
   e. CHEM 543
   f. CHEM 544 (3 Credits)
   g. E_MIC 586 and E_MIC 587
   h. HORT 518
   i. MBIOS 503
   j. MBIOS 514
   k. MBIOS 540
   l. MBIOS 542
   m. MBIOS 578
   n. MPS 525
   o. PL_P 535
   p. VET_PH 505
   q. VET_PH 555

4. GPA requirement: Cumulative GPA may not fall below a 3.0

5. Participation in Biotechnology Training Program Forum meetings and events

6. Industrial Internship
Washington State University NIH Program in Biotechnology

Emphasis on Protein Chemistry

GUIDELINES FOR COURSEWORK

Required Courses

1. **Protein Biotechnology** (MPS 574 or MBIOS 574 or Ch E 574 - 3 cr.) Alternate spring semesters, taken in spring of year 1 or 2. Created for our Training Program, this course is organized around the development of interdisciplinary biotechnology proposals by teams of students with varied backgrounds. Selected Training faculty and invited guest speakers from academia and industry lecture on their specialties.

2. **General Biochemistry I** (MBIOS 513 - 3 cr.) Fall semesters, usually taken in fall of year 1. Structure and organization of proteins and nucleic acids; protein folding; fundamental principles of enzymology; lipids, membranes and polysaccharides; experimental techniques and strategies. Trainees with engineering or non-biological science can take MbioS 303 Introductory Biochemistry (4 cr.) and then, as appropriate, MbioS 513.

3. **Bioethics** (PHIL 530 - 2 cr.) Fall semesters. A centralized campus-wide bioethics course that is team taught by experts in relevant scientific fields. The areas covered in the course include: Ethical Theory and Reasoning; Responsible Conduct of Research; Ethical Issue in Publishing/Intellectual Property/Biotechnology Product Development; Bioethics Regarding: Genetically Modified Organisms, Advanced Reproductive Technologies (i.e., cloning), Animal and Human Research Use Issues and Biotechnology Advances.

**Plus one elective course** from the following list:

1. **Cellular Bioengineering** (BIO_ENG 550 – 3 cr.) Cellular biology integrated with engineering science; cellular phenomena from an engineering perspective; quantitative engineering principles for cellular-based materials, diagnostic devise and sensor designs.

2. **Biochemical Engineering** (CH E 560 – 3 cr.) Chemical engineering applied to biological systems; fermentation processes, biochemical reactor design, downstream processing, transport phenomena in biological systems, biochemical technology. Typically offered Spring.
3. **Biofilms (CH E 581 – 3 cr.)** This class covers medical and environmental biofilms and provides fundamental knowledge needed to understand biofilm processes and biofilm control. This class targets students from life sciences to engineering.

4. **Mass Spectrometry (CHEM. 514 – 3 cr.)** Prerequisite, Chem. 425 (Instrumental Analysis) or equivalent. Current methods, techniques and interpretation of mass spectrometric analysis.

5. **Bioorganic and Medicinal Chemistry (CHEM 543 – 3 cr.)** Chemistry of biological systems, medicinal chemistry, protein chemistry, enzyme mechanisms and inhibitors.

6. **Reaction Enzyme Mechanisms (CHEM 544 – 3 cr.)** Advanced Topics in enzymatic reaction mechanisms.

7. **Special Topics and Projects in Electron Microscopy (E MIC 586/587 – 3 cr.)** Practical training in one or more areas of electron microscopy; TEM, SEM, ultramicrotomy, specimen processing; confocal fluorescent microscopy. Note, these courses are taken as a set of lecture/lab. Typically offered Fall and Spring.

8. **Postharvest Biology and Technology (HORT 518 – 3 cr.)** Physical and physiological basis for handling and storage practices; perishable organ ontogeny and physiological disorders; post-harvest environment requirements. Field trip required. Typically offered Fall.

9. **Molecular Biology I (MBIOS 503 – 3 cr.)** DNA replication and recombination, recombinant DNA methods, host/vector systems, genome analysis and transgenetic organisms.

10. **General Biochemistry II (MBIOS 514 – 3 cr.)** Carbohydrate, amino acid and lipid metabolism and its control; biochemistry of vitamins; bioenergetics; photosynthesis; nitrogen fixation.

11. **Immunology (MBIOS 540 – 3 cr.)** Principles of the immune system at the animal, cellular and molecular levels.

12. **General Virology (MBIOS 542 – 3 cr.)** Graduate level coverage of the structure, function and biology viruses that infect eukaryotic cells and organisms.

13. **Bioinformatics (MBIOS 578 – 3 cr.)** Computer analysis of nucleic acid/protein sequences and structures.
14. **Plant Molecular Genetics (MPS 525 – 3 cr.)**  Introduction to plant genome organization and gene expression while acquiring knowledge of modern molecular techniques and experimental approaches.

15. **Molecular Genetics of Plant and Pathogen Interactions (PL P 535 – 3 cr.)**  Genetic and molecular biological aspects of host-pathogen interactions. Typically offered Even Years - Spring.

16. **Design and Analysis of Biomedical Experiments (VPH 505 – 3 cr.)**  Design of experiments with application to clinical and basic biomedical research; choosing, applying, and evaluating appropriate data analysis methods.