Wilkes University Curriculum Committee
PROPOSAL SUBMITTAL FORM

Directions:
- Use this set of forms for all proposals sent to the Curriculum Committee.
- Pages 1-3 of this document are required. Any unnecessary forms should be deleted from the packet before submissions. If multiple forms are needed (course addition, course deletion, etc), simply copy and paste additional forms into this packet.
- Note that all new programs (majors and minors) and program eliminations must be reviewed and approved by the Provost and APC prior to submission to the Curriculum Committee. Significant program revisions must also undergo review and approval by the Provost. The Provost will determine if a significant proposal revision requires approval by the APC. Revisions to the General Education curriculum originate from the General Education Committee and must be reviewed and approved by the Provost.
- Completed (and signed) forms are due on the first Tuesday of every month. Submit one signed copy to the Chair of the Curriculum Committee.

1. Originators: A. Gregory S. Harms
   Division of Engineering and Physics, Department of Biology
   Tel: 570-408-4828, 570-861-9597, 570-288-2067, +49 171 127 4098
   +49 391 299 5265, +49 831 697 0321
   E-mail: gregory.harms@wilkes.edu,
   gregory.harms@imaging-microscopy.com

   B. Rodney S. Ridley
   Division of Engineering and Physics,
   Tel: 570-408-4824
   E-mail: rodney.ridley@wilkes.edu

2. Proposal Title: Master's Degree in Bioengineering

3. Check only one type of proposal: (double click on the appropriate check box and change default value to "checked"):

   - [X] New Program. (Major or Minor Degree Programs, Certificate Programs). This requires prior review and approval by the Provost and APC.

   - [ ] Elimination of Program. (Major or Minor Degree Programs). This requires prior review and approval by the Provost and APC.

   - [ ] Program Revision. Significant revisions to a program require review and approval by the Provost. The Provost determines if review and approval by APC is necessary.

   - [ ] General Education Revision. Submissions only accepted from the General Education Committee (GEC). Must be reviewed and approved by the Provost.

   - [ ] Creation of new departments, elimination of existing department. This requires prior review and approval by the Provost and APC.

   - [ ] Course additions or deletions not affecting programs (such as elective courses, transition of “topics” courses to permanent courses).

   - [ ] Change in course credit or classroom hours.

   - [ ] Incidental Changes. Includes changes in course/program title, course descriptions, and course prerequisites. (Although these changes do require approval by the Curriculum Committee, they do not go before the full faculty for approval).

   - [ ] Other (Specify)
4. Indicate the number of course modification forms that apply to this proposal:

   19  Course Addition Form (plus syllabi)
   ______  Course Deletion Form
   ______  Course Change Form

5. Executive Summary of Proposal.

   Briefly summarize this proposal. The breadth and depth of this executive summary should reflect the complexity and significance of the proposal. Include an overview of the proposal, background and reasoning behind the proposal and a description of how the proposal relates to the mission and strategic long-range plan of the unit and/or university. For incidental changes a one or two sentence explanation is adequate.

   Multiple departments in the CSE at Wilkes University have combined efforts to create a new master’s degree in bioengineering. This master’s degree contains many components of the strengths of Wilkes University, primarily engineering and biology, the two largest degree granting programs in CSE, and also chemistry, environmental sciences and mathematics. The proposed bioengineering master’s degree also benefits from broad support from the Wilkes University Administration, as the program represents new outreach into an area that receives support from local and regional industry, has support from local and regional students, can be supported by existing faculty with distinguished reputations in the field and serves as a key point of common interest with the sole medical school in the region, The Commonwealth Medical College.

   The essential needs of our constituents of potential students and of potential employers, combined with the strengths of our faculties, allow us to create a bioengineering master’s degree program that is unique: A Dual-Track program that fosters either engineers or biological scientists into bioengineers. As Wilkes University is the sole regional university with a degree granting and accredited engineering program, we can enhance our edge even further in the region by capitalizing on our strength in engineering bachelor’s and master’s programs supported by our equally strong biology bachelor’s programs. The bioengineering master’s degree will also create a regional graduate degree program for Wilkes, regional, national and international students with bachelor’s degrees in the biological, health, environmental and chemical sciences.

   The current plan is to house the program within the Department of Engineering and Physics, as it currently has three other extant graduate programs in engineering. Thus, the greatest knowledge and support of the operation for such programs is already structured and can be expanded to suit the needs of this program in terms of not only administration but also core engineering courses. As some of the faculty involved in the program have joint appointments across departments in CSE or have cross-disciplinary research in CSE, the communication and joint action of supporting faculty within CSE is excellent to support this program.

   The programs, courses and sequences we propose in this dual-track bioengineering master’s degree are comparable to our nearest competitors in the area but are unique in that our program has offerings for both engineering and biological scientists instead of just one or the other. The individual course track offering for the engineers is focused on and entitled, Biomedical Engineering. Similarly, the course track for the biological scientists is focused on and entitled Cell/Metabolic Engineering.
6. Other specific information. (Not applicable for incidental changes.)

What other programs, if any, will be affected by this proposal? Describe what resources are available for this proposal. Are they adequate? What would be the effect on the curriculum of all potentially affected programs if this proposal were adopted? Include any potential effects to the curriculum of current programs, departments and courses.

As clearly stated above, the largest supporting department, if not an equal member in this program, is the Department of Biology. The Department of Biology provides the key supporting faculty as well as housing part of the laboratory and research facilities for the Cell/Metabolic Engineering Track. As well, the Department of Biology will support the Biomedical Engineering Track with the expertise and faculty support for the biology courses needed to train the B.S. Engineers entering the program. A second major supporter for this program is the Department of Environmental Engineering/Environmental Sciences, which will provide both faculty and possible research programs for the initial core courses and for planned elective courses in the Cell/Metabolic Engineering track. Furthermore, within the program, assistance from the Department of Chemistry, primarily for the instruction of necessary chemistry and biochemistry courses, as well as research in possible areas of biochemistry, bioinformatics and bio-computational engineering is planned. Last, it is expected that the Department of Mathematics will also contribute via faculty to support the courses and research in the areas of bioinformatics pertaining to the Cell/Metabolic Engineering track. Potentially this program might be inviting for the School of Pharmacy or might even be able to exchange resources with them.

The resources available from the APC proposal as well as existing resources such as initial infrastructure and faculty from DEP and the Departments of Biology, Chemistry and Mathematics will hopefully be adequate to support the expected first year enrollment in the program. However, the effect on DEP and the Departments of Biology, Chemistry and Mathematics will be that some existing full-time faculty will need to dedicate time to instructing courses and research in the program as well as manage the program and advise the program participants. This means that there will be some new courses added and/or some existing and planned cross-listed courses in this program will increase course sizes, as well as requests for faculty, new equipment and more facility space.
7. Program Outline. (Not applicable for incidental changes).
A semester-by-semester program outline as it would appear in the bulletin for a new
program or any modified program with all changes clearly indicated.

Course Track: Biomedical Engineering

First Semester
1. Introduction to Bioengineering – Begr 409
2. Integrated Product Development – Begr 411
3. Applied Engineering Analysis – Begr 401

Second Semester
1. 3D Modeling of Human Anatomy and Physiology – Begr 415
2. BioMEMs – Begr 408
3. Biomedical Devices and Design – Begr 488

Third Semester
1. Mechatronics - Begr 451
2. Imaging in Biomedicine – Begr 474
3. Thesis/Project (3 Credits) - Begr 599

Fourth Semester
1. Elective - Nanotechnology – Begr 452
2. Elective – eg. Cellular Biophysics – Begr 472
3. Thesis/Project (3 Credits) – Begr 599

Course Track: Cell/Metabolic Engineering

First Semester
1. Introduction to Bioengineering – Begr 409
2. Integrated Product Development – Begr 411
3. Biochemistry – Begr 465

Second Semester
1. Molecular Biology – Begr 424
2. Bioinformatics – Begr 430
3. Cellular Biophysics – Begr 472

Third Semester
1. Bioengineering Experimentation and Analysis – Begr 501
2. Thesis Research (3 credits) – Begr 599
3. Elective – eg. Imaging in Biomedicine – Begr 474

Fourth Semester
1. Molecular and Cellular Bioengineering – Begr 502
2. Elective – eg. Begr 426, Begr 427, Begr 429
3. Thesis Research (3 credits) – Begr 599
8. Signatures and Recommendations. (please date)
   • Signatures of involved Department chair(s) and Dean(s) indicate agreement with the proposal and that adequate resources (library, faculty, technology) are available to support proposal.
   • If a potential signatory disagrees with a proposal he/she should write “I disagree with this proposal” and a signed statement should be attached to this submission.

[Signatures and dates]

Print Name/Title Rodney Ridley/Assoc. Prof. & Dir. Signature Date
Department chair(s) of all potentially affected programs (DEP)

Print Name/Title Brian Whitman/Assoc. Prof. Chair Signature Date
Department chair(s) of all potentially affected programs (EES/ENV)

Print Name/Title Kenneth Pidcock/Prof., Chair Signature Date
Department chair(s) of all potentially affected programs (Dept. Biology)

Print Name/Title Amy Bradley, Assoc. Prof., Chair Signature Date
Department chair(s) of all potentially affected programs (Dept. Chemistry)

Print Name/Title Dale Bruns/ Prof., Dean Signature Date
Dean(s) of any potentially affected College/School. (CSE)

Print Name/Title Bernhard Graham/ Prof., Dean Signature Date
Dean(s) of any potentially affected College/School. (Pharm/Nursing)
Print Name/Title Mike Speziale, Dean
Dean (s) of any potentially affected College/School. (Graduate School)

Print Name Susan Hritzak
Registrar

Print Name Reynold Verret
Provost (For new programs, program elimination, significant program revisions and revisions to the General Education curriculum).
Provost should check here V if this proposal is a program revision AND the significance of the revision requires review and approval by APC prior to Curriculum Committee.

Print Name Mary McManus, Prof.
Chair, Academic Planning Committee. For new programs, program elimination, and significant program revisions sent via the provost. Signature indicates that the proposal has been reviewed and approved by APC.

Print Name
Chair, General Education Committee. For revisions to General Education curriculum only.
(Signature indicates that the proposal has been approved by GEC).
Wilkes University Curriculum Committee
COURSE ADDITION FORM

1. Course Title: Introduction to Bioengineering

2. Course Number: BEGR 409
   Coordinate with Registrar to insure course number is available

3. Total Course Credit Hours: 3
   Classroom Hours 3    Lab Hours    Other

4. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance into Bioengineering Program or Permission from Instructors

5. Course Description (as proposed for the Bulletin):
   Course descriptions provide an overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other year, or only during a set semester, note this in the description. Course descriptions should be no more than two to three sentences in length.

   This course first covers some essential information of bioengineering and includes the required research ethics curriculum for the program. The course also samples the wide variety of bioengineering options for students who plan to enter in one of the degree tracks. The beginning lectures briefly describe the science basis for bioengineering both from biological and engineering standpoints. Bioengineering faculty will then describe the bioengineering options in the particular engineering tracks and courses as well as the research conducted by faculty in the department.
6. Required Documentation:

Proposed Syllabus  Attach proposed syllabus immediately after this document. In some situations the official syllabus may contain information which is beyond the review needs of the Curriculum Committee (such as extensive rubrics, etc). It is permissible to attach an abbreviated syllabus. In general, syllabi (whether full or abbreviated) should contain the following information: Course Title, Course Number, Credit hours, Faculty Information (name contact information, office hours), Course Description, Course Outcomes or Objectives, Assessment (grading) informations, required texts (or other things such as tools, software, etc), pertinent policies and a proposed schedule of topics.

Suggested Syllabus

Lectures: 3 hours per week
Course work and grading: There will be weekly assignments. There will be one mid-term exam, a final exam and also a course project. The grading of the work will be distributed as follows: assignments – 10%, mid-term exam – 30%, course project – 30% and final exam – 30%.

Textbooks:

Prerequisite: Undergraduate Degree in Engineering or Science and Acceptance into Bioengineering Program or Permission from Instructors

Instructors: Ridley, Terzaghi, Whitman, Zhang, Harms and Rest of Bioengineering Faculty

<table>
<thead>
<tr>
<th>Week</th>
<th>Subject</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction – Multifaceted Bioengineering</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Industrial Bioengineering – The Business</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Bioengineering Ethics</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Bioengineering: Biodevices</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Bioengineering: Biomechanics</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Bioengineering: Genetic Engineering</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Bioengineering: Bioreactors/Biochemical Engineering</td>
<td>---Mid-Term Exam---</td>
</tr>
<tr>
<td>8</td>
<td>Faculty Research Lectures: Zhang,</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Faculty Research Lectures: Terzaghi</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Faculty Research Lectures: Harms, Lucent</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Faculty Research Lectures: Whitman</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Faculty Research Lectures: Ghorieshi,</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Faculty Research Lectures: Ridley</td>
<td></td>
</tr>
</tbody>
</table>
Wilkes University Curriculum Committee
COURSE ADDITION FORM

7. Course Title: Integrated Product Development

8. Course Number: _BEGR 411 (cross list ME 411)_
Coordinate with Registrar to insure course number is available

9. Total Course Credit Hours: ___3____
Classroom Hours ___3____ Lab Hours ___ ___ Other ___

10. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance into Bioengineering Program or Permission from Instructors

11. Course Description (as proposed for the Bulletin): Course descriptions provide an overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other year, or only during a set semester, note this in the description. Course descriptions should be no more than two to three sentences in length.

Insert Text Here…
Organizational issues and decision-making for capital investments in new technologies. The product development and commercialization process is traced from research and development and marketing activities through the implementation phase involving the manufacturing function. Term project is a commercialization plan for a new manufacturing technology.
12. Required Documentation:

Proposed Syllabus  Attach proposed syllabus immediately after this document. In some situations the official syllabus may contain information which is beyond the review needs of the Curriculum Committee (such as extensive rubrics, etc). It is permissible to attach an abbreviated syllabus. In general, syllabi (whether full or abbreviated) should contain the following information: Course Title, Course Number, Credit hours, Faculty Information (name contact information, office hours), Course Description, Course Outcomes or Objectives, Assessment (grading) information, required texts (or other things such as tools, software, etc), pertinent policies and a proposed schedule of topics.

Syllabus – BEGR-411 (ME-411) Product Development
(Cross-listed as ME-398 and EGM-536)

Fall, 2011
Instructor: John H. Welsch

Course Description

Business issues and decision-making for new products. The product development and commercialization process is traced from market research through commercialization. In short, the course covers the entire NPD (New Product Development) process except the actual design and engineering of a product. The term project is a commercialization plan for a new product or service.

Perspective

Success in the realm of product development is dependent on much more than technical expertise. This course concentrates on those other critical elements. It is a study of customer and marketing concerns, organizational issues, and decision-making techniques related to the identification, development and introduction of new products.

Elements of finance are introduced as a background for investment decision making. The non-technical aspects of New Product Development are traced from the identification of an opportunity through design, manufacture, and introduction. Heavy emphasis is placed on Marketing, including identification of opportunities, determining user needs, conceptualizing a response, and positioning the product against competitive alternatives. Very little attention is given to the technical aspects of the product itself.

As a term project, the student will work in a team environment to identify a new product opportunity, justify its development, and formulate a commercialization plan.
Objectives

Too often, engineers’ and scientists’ careers are limited by a perspective that is excessively focused on the technical aspects of their profession. Success in the business world requires a comprehensive appreciation of the inter-relationships of Research, Design, Engineering, Manufacturing, Marketing and Finance. The objective of this course is the development of a broad perspective of the new product development process from a business standpoint. Put more simply, it is the study of the non-engineering aspects of new product development.

Prerequisites

While there are no course prerequisites in the traditional sense, students will be expected to apply themselves energetically to new concepts and to learn to think and act as businessmen and women. Undergraduates must be specifically recommended by their advisor.
<table>
<thead>
<tr>
<th>Class #</th>
<th>Date</th>
<th>Topic(s)</th>
<th>Recommended Readings</th>
<th>Assignments Due*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug. 29</td>
<td>Introductions, Housekeeping, Overview, Critical Success Factors</td>
<td>Cooper, Ch. 1-2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sept. 12</td>
<td>Corporate and New Product Strategy</td>
<td>Cooper, Ch. 3</td>
<td>Assignment 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ulwick, Intro &amp; Ch 4</td>
<td>Personal Bus. &amp; Objectives</td>
</tr>
<tr>
<td>3</td>
<td>Sept. 19</td>
<td>Identifying Customer Needs (Project will be explained and teams assigned)</td>
<td>Cooper, Ch. 6</td>
<td>First day for Assignment #2**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ulwick, Ch. 2-3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Sept. 26</td>
<td>Group Creativity</td>
<td>Ulwick, Ch. 4-5</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Oct. 3</td>
<td>Financial Issues</td>
<td>&lt;Lecture notes&gt;</td>
<td>Assignment #3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Financial Analysis</td>
</tr>
<tr>
<td>6</td>
<td>Oct. 10</td>
<td>Product Positioning, Product Pricing</td>
<td>&lt;Lecture notes&gt;</td>
<td>Assignment #4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ulwick, Ch. 6-8</td>
<td>Part 1a</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Scope Definition</td>
</tr>
<tr>
<td>7</td>
<td>Oct. 17</td>
<td>Intellectual Property</td>
<td>&lt;Lecture notes&gt;</td>
<td>Assignment #4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Part 1b</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Executive Summary</td>
</tr>
<tr>
<td>8</td>
<td>Oct. 24</td>
<td>Project Part 1 - Oral Presentations**</td>
<td></td>
<td>Assignment #4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Part 1c</td>
</tr>
<tr>
<td>9</td>
<td>Oct. 31</td>
<td>Project Part 1 - Oral Presentations**</td>
<td></td>
<td>Presentation Materials**</td>
</tr>
<tr>
<td>10</td>
<td>Nov. 7</td>
<td>The Stage Gate™ Process</td>
<td>Cooper, Ch. 7-9</td>
<td>Last day for Assignment #2 ***</td>
</tr>
<tr>
<td>11</td>
<td>Nov. 14</td>
<td>The Diffusion Process</td>
<td></td>
<td>Assignment #4</td>
</tr>
<tr>
<td>12</td>
<td>Nov. 21</td>
<td>Products Liability</td>
<td>&lt;Lecture notes&gt;</td>
<td>Final Project Reports</td>
</tr>
<tr>
<td>13</td>
<td>Nov. 28</td>
<td>Risk Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Dec. 5</td>
<td>Portfolio Management /wrap-up</td>
<td>Cooper, Ch. 4-5</td>
<td></td>
</tr>
</tbody>
</table>
* Assignments are due by noon of the Saturday before the day of class. They must be e-mailed to the e-mail address listed above. Please note that 12:01 is late! Pay careful attention to filename expectations. Grades will be reduced on late assignments unless arrangements for special circumstances have been made in advance.

** Support information for the term project in-class presentations (PowerPoint Slides and Handouts) are due from all teams on the Saturday before the first presentations. On the evening of the first presentations, the order of presentation will be determined by chance. If class size is small, presentations will all be made on the same evening (probably the later of the two but that is open for discussion.)

*** Assignment 2, "Recognition of Innovation" will extend through much of the semester. See assignment for details. Date shown is last possible presentation.

Grade Determination*

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognition of Innovation</td>
<td>15%</td>
</tr>
<tr>
<td>Financial Model</td>
<td>15%</td>
</tr>
<tr>
<td>Major Team Project (2 parts) †</td>
<td>50%</td>
</tr>
<tr>
<td>Class Participation</td>
<td>20%</td>
</tr>
</tbody>
</table>

* Grades on late assignments will be reduced. Lateness assignment #3 will mean SEVERELY reduced grade!
† Individual grade ± by peer and instructor evaluation.

Final grade may be adjusted at instructor's option.

Texts


Software

The student will need to have access to and some knowledge of Microsoft Word, Excel and PowerPoint. E-mail and the Internet will be the primary means of communication outside of class.
13. Course Title: Applied Engineering Analysis

14. Course Number: BEGR 401 (cross list with ME 401)
   Coordinate with Registrar to insure course number is available

15. Total Course Credit Hours: 3
   Classroom Hours 2
   Lab Hours 2
   Other

16. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance into Bioengineering Program or Permission from Instructors

17. Course Description (as proposed for the Bulletin): Course descriptions provide an overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other year, or only during a set semester, note this in the description. Course descriptions should be no more than two to three sentences in length.

   This course is a graduate level course whose focus is to present, illustrate and apply the calculus of single, multivariable and vector-valued functions to a variety of mechanical and electrical engineering and physics topics at an advanced level. Topics include ordinary differential equations, series solutions of ordinary differential equations and special functions, inner product spaces, vector analysis, operator algebra, matrix methods and eigenvalue problems, Fourier series and integrals, complex variables, Sturm-Liouville theory, transform methods and partial differential equations.
18. Required Documentation:

Proposed Syllabus  Attach proposed syllabus immediately after this document. In some situations the official syllabus may contain information which is beyond the review needs of the Curriculum Committee (such as extensive rubrics, etc). It is permissible to attach an abbreviated syllabus. In general, syllabi (whether full or abbreviated) should contain the following information: Course Title, Course Number, Credit hours, Faculty Information (name contact information, office hours), Course Description, Course Outcomes or Objectives, Assessment (grading) informations, required texts (or other things such as tools, software, etc), pertinent policies and a proposed schedule of topics.

**BEGR 401 (ME 401)**

**Syllabus**

A. General Information: Required course for bioengineering master’s degree students

*Coordinator:* Dr. John L. Orehotsky, Professor of Physics and Engineering

*Contact Information:* SLC 152; john.orehotsky@wilkes.edu; 570-408-2627

Office hours: 10:00 – 11:00 am daily

Texts: Mathematics for Engineers and Physics Majors by J. Orehotsky (Wilkes)

References: Advanced Engineering Mathematics by Wylie (Mc Graw-Hill)

Engineering Mathematics by Kreizek (Wiley)

Advanced Modern Engineering Mathematics by James (Pearson)

B. Catalog Description: This course is a graduate level course whose focus is to present, illustrate and apply the calculus of single, multivariable and vector-valued functions to a variety of mechanical and electrical engineering and physics topics at an advanced level. Topics include ordinary differential equations, series solutions of ordinary differential equations and special functions, inner product spaces, vector analysis, operator algebra, matrix methods and eigenvalue problems, Fourier series and integrals, complex variables, Sturm-Liouville theory, transform methods and partial differential equations.

C. Prerequisites: MTH 111, 112, 211 or 212

D. Learning Objectives: This course is a graduate level course whose focus is to present, illustrate and apply the calculus of single, multivariable and vector-valued functions to a variety of mechanical and electrical engineering and physics topics at an advanced level. Topics include ordinary differential equations, series solutions of ordinary differential equations and special functions, inner product spaces, vector analysis, operator algebra, matrix methods and eigenvalue problems, Fourier series and integrals, complex variables, Sturm-Liouville theory, transform methods and partial differential equations.

E. Topics Covered:

- Ordinary differential Equations
- Series Solutions of Ordinary Differential Equations and Special Functions
- Fourier Series and Integrals
- Partial Differential Equations
- Vector Analysis
F. Homework, Laboratory and Exams:
   • There will be about 10 homework assignments.
   • About 10 laboratory sessions and laboratory reports for verifying the application of
     the mathematical solutions of topics in mechanical engineering (vibrations, heat
     transfer), electrical engineering (circuits, electromagnetism), physics (nuclear
     reactions) and chemistry (chemical kinetics)
   • Three exams

G. Grading:

1. 3 one-hour exams + homework (10 = 1 exam) 75%; Lab 25% including a lab final exam
    (=10% of lab grade)
2. Final grade will be determined by: 94 – 100: 4.00; 87-93: 3.5; 80-86: 3; 73-79: 2.5;
   66-72: 2; 59-65: 1.5; 52-58: 1; 51 and below: 0
3. Lab reports*: See lab manual
   Lab reports are due one week after lab is finished. Lab attendance is required. One
   fails the course if one is absent for more than two labs.
Wilkes University Curriculum Committee
COURSE ADDITION FORM

19. Course Title: 3D Modeling in Human Anatomy and Physiology

20. Course Number: BEGR 415
   Coordinate with Registrar to insure course number is available

21. Total Course Credit Hours: 3
   Classroom Hours 2
   Lab Hours 3
   Other

22. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance into Bioengineering Program or Permission from Instructors

23. Course Description (as proposed for the Bulletin): Course descriptions provide an overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other year, or only during a set semester, note this in the description. Course descriptions should be no more than two to three sentences in length.

   This is a one-semester course that will provide a foundation in Human Anatomy and Physiology for Graduate Engineering students in preparation for the design and evaluation of biomedical devices. Topics to be covered include: anatomical terminology; cell, tissue and organ structure; as well functional anatomy of muscles, joints, nervous, cardiovascular, respiratory, digestive, and urinary systems. Laboratory exercises will include 3D modeling of these systems and physiological recording of muscle contraction, action potentials, EEG, ECG, heat rate, pulse, and respiratory movements.
24. Required Documentation:
   Proposed Syllabus    Attach proposed syllabus immediately after this document. In some situations the official syllabus may contain information which is beyond the review needs of the Curriculum Committee (such as extensive rubrics, etc). It is permissible to attach an abbreviated syllabus. In general, syllabi (whether full or abbreviated) should contain the following information: Course Title, Course Number, Credit hours, Faculty Information (name contact information, office hours), Course Description, Course Outcomes or Objectives, Assessment (grading) information, required texts (or other things such as tools, software, etc), pertinent policies and a proposed schedule of topics.

**General Information:**

Lecture Time             M 6:00 PM – 7:50 PM  
Laboratory Time          R 6:00 PM – 8:45 PM  
Instructors:             Dr. Linda S. Gutierrez  
                        Dr. Valerie G. Kalter 
                        SLC 354A  
                        SLC 372 
                        570-408-4636  
                        570-408-4752 
Office Hours:            TBA  
                        TBA 

**Catalog Description:**

3 credit hours: 2 hours of lecture/recitation and 3 hours of laboratory

**Textbooks:**


**Prerequisites:**

Undergraduate Degree in Engineering and Acceptance into Bioengineering Program or Permission of Instructor
Summary:

This is a one-semester course that will provide a foundation in Human Anatomy and Physiology for Graduate Engineering students in preparation for the design and evaluation of biomedical devices. Topics to be covered include: anatomical terminology; cell, tissue and organ structure; as well functional anatomy of muscles, joints, nervous, cardiovascular, respiratory, digestive, and urinary systems. Laboratory exercises will include 3D modeling of these systems and physiological recording of muscle contraction, action potentials, EEG, ECG, heat rate, pulse, and respiratory movements.

Course Objectives:

Overall Objectives:

1. Students will identify and describe the basic anatomy and physiology of the various organ systems of the human body. Students will review functional anatomy in order to relate the importance of structure-function relationships, i.e., how form meets function.

2. Students will tell how the body is organized at increasing levels of complexity, from cells to tissues to organs to organ systems to the total human being.

3. Students will describe how the body’s systems operate under normal conditions, with an emphasis on three dimensional organization and modeling of structures such as joints and muscles.

4. Laboratory exercises will enable students to demonstrate their knowledge of basic anatomy and physiology with hands-on experience in selected physiological recording methods, human anatomical models, and software for the 3D rotation and modeling of anatomical structures.

Specific Objectives:

1. Students should be able to define describe the basic structure and function of the human organism by studying, in order of increasing complexity, the various blocks of the body: building
   a. Atoms and molecules; inorganic vs. organic building blocks of more complex molecules.
   b. The “big four” organic molecule groups: proteins, carbohydrates, lipids and nucleic acids.
   c. The organization of organic molecules into cellular organelles and cells.
   d. Groups of similar cells with common functions make up tissues (histology).
   e. Groups of tissues working together make up organs, such as the liver.
   f. Organs working together or in sequence form organ systems, such as the digestive system.
g. All of the body’s systems interact to maintain the normal functioning of the person in the process of homeostasis, or maintenance of the "status quo."

2. Students should be able to locate and name detailed anatomical subdivisions and parts of organ systems using human models, bones, slides, and demonstrations. Each of the following areas or systems will be examined in turn, in both the lectures and laboratory exercises:
   a. Cells and Tissues (Histology)
   b. Integumentary System (Skin)
   c. Skeletal System
   d. Muscular System
   e. Nervous System
   f. Cardiovascular System
   g. Respiratory System
   h. Digestive System
   i. Urinary System

3. Students should be able to define, restate and apply the medical terminology associated with the study of physiology and anatomy, which the student will find useful throughout his or her career.

4. Students should be able to use the microscope in order to examine and interpret the microscopic anatomy of cells, tissues (histology), and selected organs of the human body.

5. Students should be able to record and evaluate the normal functioning of the various systems (physiology) and obtain a basic understanding of how alterations in normal anatomy and/or physiology (pathophysiology) may lead to various disorders that the student will later be able to design, develop and evaluate medical devices to treat selected disorders.

6. Students should be able to use the Interactive Physiology CD-ROM that accompanies the text, and also be able to access and use additional software such as A.D.A.M. Interactive Anatomy and other materials for 3D modeling of the human body.

25. Through the use of specific examples, students should be able to apply basic principles to the understanding of simple clinical situations that may be discussed in class or laboratory exercises.

**Evaluation and Grading:**

1. Three lecture exams 50%
2. Three laboratory exams 25%
3. Attendance and participation in class and laboratory 5%
4. Final Exam 20%

The course grade will be determined as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;= 90 (4.0)</td>
<td>85 - 89 (3.5)</td>
</tr>
<tr>
<td>DATE</td>
<td>LECTURE TOPIC</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Week 1</td>
<td>Introduction; Overview of Human Body Biomolecules and Biochemistry</td>
</tr>
<tr>
<td>Week 2</td>
<td>Cell Structure and Function Intro. to Tissues (Histology)</td>
</tr>
<tr>
<td>Week 3</td>
<td>Tissues (Histology) Integumentary System (Skin)</td>
</tr>
<tr>
<td>Week 4</td>
<td>Bone Structure and Development Articulations (Joints)</td>
</tr>
<tr>
<td>Week 5</td>
<td>Joints Muscle Structure and Physiology</td>
</tr>
<tr>
<td>Week 6</td>
<td>Muscle Structure and Physiology Neurons, Synapses, Neurotransmitters</td>
</tr>
<tr>
<td>Week 6</td>
<td>Neuronal Signaling Brain Waves and EEG</td>
</tr>
<tr>
<td>Week 7</td>
<td>Brain and Spinal Cord Structure Motor Integration and Reflexes</td>
</tr>
<tr>
<td>Week 8</td>
<td>Sensory Receptors and Sensation Optics of Vision; Sound and Hearing</td>
</tr>
<tr>
<td>Week 9</td>
<td>Anatomy and Physiology of the Heart Electrical Activity of the Heart</td>
</tr>
<tr>
<td>Week 10</td>
<td>Heart Sounds and Valve Function Blood Vessel Anatomy</td>
</tr>
<tr>
<td>Week 11</td>
<td>Circulation Biophysics Regulation of Blood Pressure &amp; Flow</td>
</tr>
</tbody>
</table>

21
Week 12  Respiratory System Anatomy
         Mechanics of Breathing
         Gas Exchange and Regulation

Week 13  Digestive System Structure & Function

Week 14  Urinary System Anatomy
         Urine Formation, Body Fluids
         Electrolyte and Acid-Base Balance

Chapter 22  Respiratory Movements
Chapter 23  Digestion
Chapter 25  Urinalysis
Chapter 26

Prepared by:
Dr. Valerie G. Kalter, Biology Department, March 5, 2012
Wilkes University Curriculum Committee
COURSE ADDITION FORM

26. Course Title: BioMEMs

27. Course Number: BEGR 408
Coordinate with Registrar to ensure course number is available

28. Total Course Credit Hours: 3
   Classroom Hours 2 Lab Hours 3 Other

29. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance into Bioengineering Program or Permission from Instructors

30. Course Description (as proposed for the Bulletin): Course descriptions provide an overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other year, or only during a set semester, note this in the description. Course descriptions should be no more than two to three sentences in length.

   This course is about the basic foundations for the understanding of electrical, mechanical and chemical transducers in biomedical applications through learning fabrication, design and analysis. The course will have lectures to cover the theory and practical applications of imaging. Some of the lectures and assignments will be in our materials fabrication laboratories.
31. Required Documentation:

Proposed Syllabus

Attach proposed syllabus immediately after this document. In some situations the official syllabus may contain information which is beyond the review needs of the Curriculum Committee (such as extensive rubrics, etc). It is permissible to attach an abbreviated syllabus. In general, syllabi (whether full or abbreviated) should contain the following information: Course Title, Course Number, Credit hours, Faculty Information (name contact information, office hours), Course Description, Course Outcomes or Objectives, Assessment (grading) informations, required texts (or other things such as tools, software, etc), pertinent policies and a proposed schedule of topics.

BioMEMs
Course Outline and Syllabus

GENERAL INFORMATION

Instructor: Dr. Ali Razavi, Professor of Mechanical Engineering
Office: SLC 127

Phone: 570-408-4818
E-Mail: ali.razavi@wilkes.edu
Office Hours: MWF 8:00 A.M. – 10:00 A.M., or by appointment

CATALOG DESCRIPTION
Micro Sensor and Actuator, Three credits
Two hours lecture, and three hours lab per week.

This course explores the principle of Sensing by understanding materials properties, micro-machining, sensor and actuator principles. It will be demonstrated that Micro transduction are integrated micro-devices combining mechanical and electrical systems which convert physical properties to electrical signals and consequently detection.

PREREQUISITES
Degree in Mechanical or Electrical Engineering.

TEXTBOOK

COURSE Objectives:
This course explores the principle of sensing by understanding materials properties, micro-machining, sensor and actuator principles. It will be demonstrated that micro transduction are integrated micro-devices combining mechanical and electrical systems which convert physical properties to electrical signals and consequently detection.

COURSE TOPICS
- Transduction mechanism and materials
- Micro-fabrication tool box
- Electronic signal processing of sensor outputs
- Mechanical micro-sensors and actuators principles
• Piezoelectric Sensors- Principles of piezoelectricity, piezo materials, piezo sensors including accelerometers, force, and pressure sensors, applications for these sensors and the pros and cons of piezo sensing.
• Semiconductor sensors- Principles of semiconduction, semiconductor materials, semiconductor sensors for magnetic, thermal, chemical and other applications, and the pros and cons of these sensors
• Superconductive Sensors- Principles of superconductivity, superconductive materials, superconductive sensors such as bolometers and SQUIDS, the applications where these sensors are employed and the pros and cons of superconductive sensors.

• MEMS sensors- Principles of microelectromechanical sensors, materials for bulk and thin film sensors, specific application of a low noise, MEMS IR sensor, and the pros and cons of these sensors.
• Environmental sensing including; Water and Air sensors
• Fundamental of GMR Sensors
• Cell Biology
• Bio-MEMS & Bio-GMR sensors
• Design Project

GRADING POLICY
• Lab work during the semester 30%
• Design project progress report during the semester 45%
• Final design project report and presentation 25%

ATTENDANCE POLICY: Regular attendance is required

Prepared by: Ali Razavi, Professor of Mechanical Engineering
Design projects:
Electroless deposition of metals on nano materials
Nanomagnetic materials and attachment to biostructure
GMR sensor detection and processing
Wilkes University Curriculum Committee
COURSE ADDITION FORM

32. Course Title: Biomedical Devices & Design

33. Course Number: BEGR 488

Coordinate with Registrar to insure course number is available

34. Total Course Credit Hours: 3
   Classroom Hours 2
   Lab Hours 1

35. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance into Bioengineering Program or Permission from Instructors

36. Course Description (as proposed for the Bulletin): Course descriptions provide an overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other year, or only during a set semester, note this in the description. Course descriptions should be no more than two to three sentences in length.

This course discusses the design development and evaluation of medical devices. The goal is to develop the thinking and research tools that will enable students to understand medical devices as products as commercially available technological solutions to medical needs. This total understanding is based upon the coordinate separated understandings of: 1) underlying medical science and clinical practice; 2) underlying technologies and the potential choices between available technologies; 3) engineering design; and 4) technological and business direction of companies.
37. Required Documentation:
   Proposed Syllabus   Attach proposed syllabus immediately after this document. In some situations the official syllabus may contain information which is beyond the review needs of the Curriculum Committee (such as extensive rubrics, etc). It is permissible to attach an abbreviated syllabus. In general, syllabi (whether full or abbreviated) should contain the following information: Course Title, Course Number, Credit hours, Faculty Information (name contact information, office hours), Course Description, Course Outcomes or Objectives, Assessment (grading) informations, required texts (or other things such as tools, software, etc), pertinent policies and a proposed schedule of topics.

   General Information:
   Lecture Time:   M 6:00pm-8:45pm
   Instructor:   X. Zhang; 236 SLC; 570-408-4832
               xiaoli.zhang@wilkes.edu
   Office Hours:   T 1pm-6pm

   Catalog Description:
   3 credit hours

   Textbook: A Primer on Engineering Design of Biomedical Devices, C. A. Nelson (e-book)

   Supplemental References:

   Prerequisites:
   Topics: Strength of Material; Statics; Mechatronics; or permission by the instructor

   Summary:
   This course discusses the design, development, and evaluation of medical devices. The goal is to develop the thinking and research tools that will enable students to understand medical devices as products: commercially available technological solutions to medical needs. This total understanding is based upon the coordinate separated understandings of: 1) underlying medical science and clinical practice; 2) underlying technologies and the potential choices between available technologies; 3) engineering design; and 4) technological and business direction of companies.

   Instructor/Student Roles:
   In addition to being available during class and regular office hours, I will respond to your questions via email within 1 working day.
   This course, while offered in a traditional lecture format, will refer to online resources. Students are expected to check the LlIVE site regularly for announcements, assignments, etc. I welcome your comments on how to make this online interaction more effective as more and more of the teaching content gets transferred to online and other formats.
ADA and Accommodation:
Students with disabilities are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation. It is the policy of the Wilkes University to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements.

Objectives:
1. Develop an understanding of the behavior and properties of tissues and biomaterials, including biocompatibility.
2. Understand the practical aspects and criteria involved in biomedical design.
3. Develop an understanding of systematic design methods in the context of biomedical engineering.
4. Be exposed to a broad range of biomedical devices.

Topics:
1. Concepts of medical device, medical technology, and medical product
2. Classifications of medical devices
3. Overview of tissues – properties and behavior
4. Overview of biomaterials – properties and biocompatibility
5. Product definition and development
6. Reliability, safety, and quality
7. Case studies – medical robots, bioinstruments, artificial organs, rehabilitation, virtual reality, haptics, remote palpation, etc.

Evaluation:
1. 3 Exams
2. 7-11 Homework Assignments
3. 5-10 in-class quizzes
4. Project

Homework. Homework must be neat and organized. Late homework will not be accepted. Homework is due at the beginning of class unless otherwise specified. Homework problems will be indicative of exam problems (i.e. if you can do the homework you should do well on exams).

Exams. Three exams will be given. Each exam will cover all material presented/assigned to date. In general, no make-up exams will be given.

You must pass the exams to expect a passing grade in the course. If your total cumulative exam grade is less than a 1.5, then your course grade may not exceed your exam average.

Final project. Graduate students (400-level) will be required to submit a final report covering a research topic in current literature. Undergraduates (300-level) will also be expected to produce a report, with fewer requirements. A rubric detailing the requirements and point values will be provided.

Quizzes. Quiz questions will be based on assigned homework.

Participation. Throughout the semester, in-class group discussions will be assigned, and every student should get a chance to present the results of their discussions to the rest of the class.

Grading:
Class attendance is required. If you would like to discuss any grade, you must do so within one week of when the graded work was returned.

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams (3)</td>
<td>50%</td>
</tr>
<tr>
<td>Homework</td>
<td>15%</td>
</tr>
<tr>
<td>Final project</td>
<td>15%</td>
</tr>
</tbody>
</table>

28
The final course grade will be determined as follows:
$\geq 92 \ (4.0) \ ; \ 85 - 91 \ (3.5) \ ; \ 80 - 84 \ (3.0) \ ; \ 75 - 79 \ (2.5) \ ; \ 70 - 74 \ (2.0) \ ; \ 65 - 69 \ (1.5) \ ; \ 60 - 64 \ (1.0) \ ; \ < 60 \ (0.0)$

### MECH 398/498 Tentative Schedule – Spring 2012

<table>
<thead>
<tr>
<th>1</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction (1 lecture)</strong></td>
<td></td>
</tr>
<tr>
<td>Standards and codes</td>
<td></td>
</tr>
<tr>
<td>The FDA and device design</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2</th>
<th>Bioenvironment (3 lectures)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elastin, collagen</td>
<td></td>
</tr>
<tr>
<td>bone</td>
<td></td>
</tr>
<tr>
<td>Muscle</td>
<td></td>
</tr>
<tr>
<td>Cartilage and general viscoelasticity</td>
<td></td>
</tr>
<tr>
<td>Blood and blood vessels</td>
<td></td>
</tr>
<tr>
<td>Respiratory system; intro to biocompatibility</td>
<td></td>
</tr>
<tr>
<td>Intro to biocompatibility</td>
<td></td>
</tr>
<tr>
<td>Exam 1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3</th>
<th>Biomaterials (3 lectures)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metals as biomaterials</td>
<td></td>
</tr>
<tr>
<td>Ceramic and Composites as biomaterials</td>
<td></td>
</tr>
<tr>
<td>Polymers as biomaterials</td>
<td></td>
</tr>
<tr>
<td>Material selection</td>
<td></td>
</tr>
<tr>
<td>Material selection</td>
<td></td>
</tr>
<tr>
<td>Exam 2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4</th>
<th>Design Methodologies (4 lectures)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Define and meet product requirements</td>
<td></td>
</tr>
<tr>
<td>Function decomposition</td>
<td></td>
</tr>
<tr>
<td>Design for manufacture</td>
<td></td>
</tr>
<tr>
<td>Design for manufacture and assembly</td>
<td></td>
</tr>
<tr>
<td>Quality function deployment</td>
<td></td>
</tr>
<tr>
<td>Reliability</td>
<td></td>
</tr>
<tr>
<td>Failure modes and effects analysis</td>
<td></td>
</tr>
<tr>
<td>Summary and recap</td>
<td></td>
</tr>
<tr>
<td>Exam 3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5</th>
<th>Case studies (3 lectures)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case studies – surgical tools</td>
<td></td>
</tr>
<tr>
<td>Case studies – surgical tools</td>
<td></td>
</tr>
<tr>
<td>Case studies – blood flow and pressure measurement</td>
<td></td>
</tr>
<tr>
<td>Case studies – electrocardiograph</td>
<td></td>
</tr>
<tr>
<td>Case studies – medical robotics</td>
<td></td>
</tr>
<tr>
<td>Case studies – medical robotics</td>
<td></td>
</tr>
<tr>
<td>Case studies-Rehab devices</td>
<td></td>
</tr>
</tbody>
</table>

**Prepared By:**
X. Zhang, Assistant Professor, Mechanical Engineering, January, 2012
Wilkes University Curriculum Committee
COURSE ADDITION FORM

38. Course Title: Mechatronics/Bioinstrumentation

39. Course Number: BEGR 451(cross list with ME 451)
Coordinate with Registrar to insure course number is available

40. Total Course Credit Hours: 3
   Classroom Hours: 2
   Lab Hours: 1
   Other

41. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance into
   Bioengineering Program or Permission from Instructors

42. Course Description (as proposed for the Bulletin): Course descriptions provide an
   overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other
   year, or only during a set semester, note this in the description. Course descriptions should
   be no more than two to three sentences in length.

   Mechatronics is a multidiscipline technical area defined as the synergistic integration of
   mechanical engineering with electronic and intelligent computer control in the design and
   manufacture of industrial products and processes. This course covers topics such as actuators and
   drive systems, sensors, programmable controllers, microcontroller programming and interfacing, and
   automation systems integration.
43. Required Documentation:

Proposed Syllabus: Attach proposed syllabus immediately after this document. In some situations, the official syllabus may contain information which is beyond the review needs of the Curriculum Committee (such as extensive rubrics, etc.). It is permissible to attach an abbreviated syllabus. In general, syllabi (whether full or abbreviated) should contain the following information: Course Title, Course Number, Credit hours, Faculty Information (name, contact information, office hours), Course Description, Course Outcomes or Objectives, Assessment (grading) information, required texts (or other things such as tools, software, etc.), pertinent policies and a proposed schedule of topics.

**Syllabus**

<table>
<thead>
<tr>
<th>Lecture/Lab</th>
<th>Contents</th>
<th>Reference Files</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td><strong>Basic concepts of Biomedical Instrumentation:</strong></td>
<td>Lecture01.ppt</td>
</tr>
<tr>
<td></td>
<td>- Generalized composition of biomedical instrumentation.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Constraints of biomedical measurement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Inferences and compensation techniques</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Static system characteristics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Dynamic system characteristics</td>
<td></td>
</tr>
<tr>
<td>Lecture</td>
<td><strong>Basic sensor principles:</strong></td>
<td>Lecture03.ppt</td>
</tr>
<tr>
<td></td>
<td>- Sensor theory: resistor, inductor, capacitor, thermal couple and piezoelectric sensor.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Bridge circuits for sensors</td>
<td></td>
</tr>
<tr>
<td>Lecture/hands-on</td>
<td><strong>LabVIEW programming, part I:</strong></td>
<td>Lecture02.ppt</td>
</tr>
<tr>
<td></td>
<td>- Introduction of virtual instrumentation and LabVIEW</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Three part of virtual instrumentation: front panel, block diagram and connector pane.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Three LabVIEW palette: control palette, function palette and tools palette.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- LabVIEW controls and indicators on front panel and block diagram.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Data flow in LabVIEW</td>
<td></td>
</tr>
<tr>
<td>Lecture/hands-on</td>
<td><strong>LabVIEW programming, part II:</strong></td>
<td>Lecture04.ppt</td>
</tr>
<tr>
<td></td>
<td>- LabVIEW data type: numeric, Boolean, string and waveform</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- WHILE and FOR loops, CASE structures, SEQUENCE structures, formula nodes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Express VI</td>
<td></td>
</tr>
<tr>
<td>Lecture/hands-on</td>
<td><strong>LabVIEW programming, part III:</strong></td>
<td>Lecture05.ppt</td>
</tr>
<tr>
<td></td>
<td>- Array and cluster functions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Error handling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Basic LabVIEW programming architecture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Graph and chart</td>
<td></td>
</tr>
<tr>
<td>Lab</td>
<td><strong>Simulation of Dynamic Responses of the First and</strong></td>
<td>Project01.doc</td>
</tr>
<tr>
<td>Lecture/hands-on</td>
<td>Second Order Linear Systems</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Lecture</strong></td>
<td><strong>Signal conditioning:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Ideal operational amplifier</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Differential amplifier</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Integrator, differentiator and comparator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Filters</td>
<td></td>
</tr>
<tr>
<td><strong>Lecture/hands-on</strong></td>
<td><strong>LabVIEW programming, part V:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Basic concepts of data acquisition</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Data acquisition application using DAQmx</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Data acquisition application using LabVIEW.</td>
<td></td>
</tr>
<tr>
<td><strong>Lab</strong></td>
<td><strong>Data Acquisition Using NI-DAQmx</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Project02.doc</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Signal Generation Using NI-DAQmx</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Lecture/hands-on</strong></td>
<td><strong>Data Analysis Using LabVIEW</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Using MATLAB code in LabVIEW</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- FFT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Digital filtering</td>
<td></td>
</tr>
<tr>
<td><strong>Lab</strong></td>
<td><strong>FAST Fourier Transform (FFT) and Digital Filtering Using LabVIEW</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Project04.doc</td>
<td></td>
</tr>
<tr>
<td><strong>Lecture</strong></td>
<td><strong>Biopotential Electrode and Amplifier</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Electrode/Electrolyte interface</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Half cell potential</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Polarization of electrode</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Electrode circuit model</td>
<td></td>
</tr>
<tr>
<td><strong>Lab</strong></td>
<td><strong>Instrumentation Amplifier</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Project05.doc</td>
<td></td>
</tr>
<tr>
<td><strong>Lab</strong></td>
<td><strong>Low-Pass and High-Pass Filters</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Project06.doc</td>
<td></td>
</tr>
<tr>
<td><strong>Lecture</strong></td>
<td><strong>Electrocardiograph:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- The origin of biopotential</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Electrocardiogram (ECG)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Electrocardiograph</td>
<td></td>
</tr>
<tr>
<td><strong>Lecture</strong></td>
<td><strong>Blood Flow and Pressure Measurement</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Electromagnetic flowmeter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Ultrasonic flowmeter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Direct blood pressure measurement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Indirect blood pressure measurement</td>
<td></td>
</tr>
<tr>
<td><strong>Lecture</strong></td>
<td><strong>Electrical safety</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Physiological effects of electricity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Macroshock hazard</td>
<td></td>
</tr>
</tbody>
</table>

32
<table>
<thead>
<tr>
<th>Lab</th>
<th>Electrocardiograph</th>
<th>Project07.doc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microshock hazard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical safety codes and standard</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Textbooks:
1. Medical Instrumentation, Application and Design. 3rd edition. By John G. Webster
2. LabVIEW six hours course by National Instruments
Wilkes University Curriculum Committee
COURSE ADDITION FORM

44. Course Title:  Nanotechnology

45. Course Number:  ___BEGR 452 (cross list with ME 452)______________
Coordinate with Registrar to insure course number is available

46. Total Course Credit Hours:  ___3____
   Classroom Hours 2____   Lab Hours 3____   Other____

47. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance into Bioengineering Program or Permission from Instructors

48. Course Description (as proposed for the Bulletin):  Course descriptions provide an overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other year, or only during a set semester, note this in the description. Course descriptions should be no more than two to three sentences in length.

This course explores the fundamentals of nanotechnology and its applications for colloidal suspension, Electrophoretic deposition and nano-sensing by understanding materials properties, micro-machining, sensor and actuator principles. Two hours of lecture and three hours of lab per week.
49. Required Documentation:
   Proposed Syllabus  Attach proposed syllabus immediately after this document. In some situations the official syllabus may contain information which is beyond the review needs of the Curriculum Committee (such as extensive rubrics, etc). It is permissible to attach an abbreviated syllabus. In general, syllabi (whether full or abbreviated) should contain the following information: Course Title, Course Number, Credit hours, Faculty Information (name contact information, office hours), Course Description, Course Outcomes or Objectives, Assessment (grading) informations, required texts (or other things such as tools, software, etc), pertinent policies and a proposed schedule of topics.

   BEGR 452(ME-452) Nanotechnology - Course Outline and Syllabus

   GENERAL INFORMATION
   Instructor: Dr. Ali Razavi, Professor of Mechanical Engineering
   Office: SLC 148
   Phone: 570-408-4818
   E-Mail: ali.razavi@wilkes.edu
   Office Hours:

   CATALOG DESCRIPTION: Nanotechnology, Three credits. Two hours lecture and three hours lab per week. This course explores the fundamentals of Nanotechnology and its applications for colloidal suspension, Electrophoretic deposition and nano-sensing by understanding materials properties, micro-machining, sensor and actuator principles.

   PREREQUISITES: Degree in Engineering.


   COURSE OBJECTIVES:
   At the completion of this course, students should be able to distinguish various classes of nano-processing;
   • Formation of a stable suspension of the particles
   • Electrophoretic migration of the particles to the deposition electrode
   • nano-fabrication tools and process
   • nano-sensors

   COURSE TOPICS:
   • Nanotechnology introduction
   • Formation of stable suspension of the particles
   • Electrophoretic migration deposition
   • Nano-fabrication tool box
   • Nano-sensors and actuators principles & fabrication
   • Nano-magnetic sensor & GMR manufacturing
   • Nano-Bio sensor
   • Nano-storage

   GRADING POLICY
   • Lab work during the semester  30%
   • Design project progress report during the semester  45%
   • Final design project report and presentation  25%

   ATTENDANCE POLICY: Regular attendance is required

   Prepared by: Ali Razavi, Professor of Mechanical Engineering

35
Wilkes University Curriculum Committee  
COURSE ADDITION FORM

50. Course Title: Imaging in Biomedicine

51. Course Number: BEGR 474  
Coordinate with Registrar to insure course number is available

52. Total Course Credit Hours: 3  
   Classroom Hours 3  Lab Hours 3  Other

53. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance into Bioengineering Program or Permission from Instructors

54. Course Description (as proposed for the Bulletin): Course descriptions provide an overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other year, or only during a set semester, note this in the description. Course descriptions should be no more than two to three sentences in length.

   Biological and medicinal imaging techniques. This course will cover different aspects of imaging important to biomedicine including optical, scanning probe, ultrasound, X-ray and nuclear radiation techniques. The course will have lectures to cover the theory and practical applications of imaging. Some of the lectures and assignments will be in our imaging laboratories both at Wilkes and/or at our partner institutions.
55. Required Documentation:

Proposed Syllabus

Attach proposed syllabus immediately after this document. In
some situations the official syllabus may contain information which is beyond the review needs
of the Curriculum Committee (such as extensive rubrics, etc.). It is permissible to attach an
abbreviated syllabus. In general, syllabi (whether full or abbreviated) should contain the
following information: Course Title, Course Number, Credit hours, Faculty Information
(name contact information, office hours), Course Description, Course Outcomes or Objectives,
Assessment (grading) informations, required texts (or other things such as tools, software, etc),
pertinent policies and a proposed schedule of topics.

Suggested Syllabus

Lectures: 3 hours per week plus laboratory

Course work and grading: There will be weekly assignments, laboratories and quizzes. There will be
one mid-term exam, a final exam and also a course project. The grading of the work will be
distributed as follows: assignments – 10%, laboratories – 15%, quizzes – 10%, mid-term exam –
20%, course project – 20% and final exam – 25%.

Textbooks:
1. Medical Physics and Biomedical Engineering by P.H. Brown, R.H. Smallwood, D.C. Barber, P.V.

Instructors: Gregory Harms, Amjad Nazzal
Prerequisites: BIO115 or Equivalent, CHM 115/116 or equivalent, PHY 171/174 or 201/202/203
or equivalent

<table>
<thead>
<tr>
<th>Week</th>
<th>Subject</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Image Formation: The Basic Theory</td>
<td>Introductory Lab</td>
</tr>
<tr>
<td>2</td>
<td>Image Formation: Basic to Advanced - Multidimensional, Noise</td>
<td>Computer Lab</td>
</tr>
<tr>
<td>3</td>
<td>Image Formation: Advanced - Fourier-Transform, Convolution Reconstruction</td>
<td>Computer Lab</td>
</tr>
<tr>
<td>4</td>
<td>Image Production: Radio Nuclide</td>
<td>External Lab</td>
</tr>
<tr>
<td>5</td>
<td>Image Production: Ultrasound</td>
<td>External Lab</td>
</tr>
<tr>
<td>6</td>
<td>Image Production: Magnetic Resonance</td>
<td>External Lab</td>
</tr>
<tr>
<td>7</td>
<td>Image Production: CT/Electrical Impedance</td>
<td>External Lab</td>
</tr>
<tr>
<td>8</td>
<td>Image Production: Electron Microscopy</td>
<td>Internal/External Lab</td>
</tr>
<tr>
<td>9</td>
<td>Image Production: Optical Microscopy- Endoscopy, Confocal, Fluorescence</td>
<td>Internal Lab</td>
</tr>
<tr>
<td>10</td>
<td>Image Production: Optical – Optical Coherence, Thermography</td>
<td>External Lab</td>
</tr>
<tr>
<td>11</td>
<td>Image Production: Atomic Force/Near Field</td>
<td>Internal/External Lab</td>
</tr>
<tr>
<td>12</td>
<td>Image Processing: Displays, Mapping, Lookup</td>
<td>Computer Lab</td>
</tr>
<tr>
<td>13</td>
<td>Image Processing: Restoration, Deconvolution</td>
<td>Computer Lab</td>
</tr>
<tr>
<td>14</td>
<td>Image Processing: Analysis</td>
<td>Computer Lab</td>
</tr>
</tbody>
</table>
Wilkes University Curriculum Committee
COURSE ADDITION FORM

56. Course Title: Biochemistry

57. Course Number: BEGR 465 (cross list with CHM 365)__________________
   Coordinate with Registrar to insure course number is available

58. Total Course Credit Hours: 3
   Classroom Hours 3     Lab Hours 3     Other_____

59. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance into
   Bioengineering Program or Permission from Instructors

60. Course Description (as proposed for the Bulletin): Course descriptions provide an
    overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other
    year, or only during a set semester, note this in the description. Course descriptions should
    be no more than two to three sentences in length.

   An introduction to metabolism and how it is studied together with an introduction to the
   physical and chemical properties of macromolecules and their precursors. The goal is to learn
   enough biochemistry and metabolism to figure out how to identify target pathways and how they
   might be engineered to produce desired products or to engineer organisms with desired capabilities.
Overview of Biochemistry

Terese M. Wignot, PhD
267 Stark Learning Center
Department of Chemistry
(570) 408-4627
wignot@wilkes.edu
Office Hours:

SYLLABUS


Major Objectives: Students in all chemistry courses are expected:

A1. To demonstrate proficiency in analysis, organization, interpretation, and presentation of chemical data.

A2. To express chemical concepts with quantitative relationships and to interpret the results obtained from the use of these quantitative relationships in terms of the chemical concepts conveyed in this format.

A3. To use written communication in a cogent and coherent form that demonstrates understanding of chemical concepts.

A4. To develop critical thinking and problem-solving skills in synthesizing information.

A5. To appreciate the relevance of chemistry to everyday life.

A6. To recognize that the various areas of chemistry are interrelated and require integration of basic chemical principles, including chemical formulae and nomenclature, chemical reactions and stoichiometry, chemical equilibria and acid-base theory, and molecular structure.

Course Objective: Students in this course are expected:

B1. To demonstrate an understanding of basic chemical principles including solution chemistry, acid/base chemistry, and intermolecular forces.
B2. To demonstrate an understanding of the structure, properties and function of proteins, specifically, enzymes.

B4. To demonstrate proficiency in analysis, interpretation, and presentation of enzyme kinetic data.

B5. To demonstrate an understanding of the structure and function of nucleic acids; replication, transcription, and translation.

B6. To demonstrate an understanding of the structure and function of lipids; membrane composition and function.

B7. To understand the catabolism and anabolism of macromolecules including the regulation of pathways and bioenergetics.

B8. To understand the reciprocal regulation of catabolic and anabolic pathways.

**Grading:** Suggested homework problems from each chapter of the text are given in the course outline. Additional homework will be assigned and graded. Three exams will be given as well as a cumulative final exam. Homework, tests and the final will be based on lecture material and homework problems. All exams are mandatory and no make-up exams will be given. In case of illness, as demonstrated by a medical certificate and upon approval of the Dean, special arrangements will be made.

**Plagiarism/Cheating.** The Wilkes University community shares "a deep commitment to academic honesty and integrity". Penalties for violation of the University plagiarism policy range from a zero on the assignment or test to course failure. Sufficiently egregious cases of plagiarism may be referred to the Student Affairs Cabinet for further disciplinary sanctions. The University recognizes the following as violations of Intellectual Responsibility plagiarism, cheating and collusion. Furthermore the University also recognizes various forms of plagiarism, deliberate, unintentional and self. Additional details can be found in the Student Handbook.

<table>
<thead>
<tr>
<th>Tentative</th>
<th>Dates*</th>
<th>Tentative %*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework Due</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Thurs Feb 9</td>
<td>Exam 1</td>
<td>Tues Feb 14</td>
</tr>
<tr>
<td>Thurs Mar 22</td>
<td>Exam 2</td>
<td>Tues Mar 27</td>
</tr>
<tr>
<td>Tues Apr 24</td>
<td>Exam 3</td>
<td>Thurs Apr 26</td>
</tr>
<tr>
<td>Final</td>
<td>Set by</td>
<td>Registrar</td>
</tr>
</tbody>
</table>

*- the %s and dates are subject to change as the semester progresses at the discretion of the instructor.

**- the highest exam score will count for 25% of your overall grade and the other two exams will count for 20% toward your overall grade.

Attendance is required under University policy. The withdraw policy of the University will be strictly enforced.
All tentative dates, point distributions and cut offs are subject to change at the discretion of the instructor.

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;90</td>
<td>4.0</td>
</tr>
<tr>
<td>85-89</td>
<td>3.5</td>
</tr>
<tr>
<td>80-84</td>
<td>3.0</td>
</tr>
<tr>
<td>75-79</td>
<td>2.5</td>
</tr>
<tr>
<td>70-74</td>
<td>2.0</td>
</tr>
<tr>
<td>65-69</td>
<td>1.5</td>
</tr>
<tr>
<td>60-64</td>
<td>1.0</td>
</tr>
<tr>
<td>&lt;60</td>
<td>0</td>
</tr>
</tbody>
</table>

**EXTRA CREDIT:** Extra credit will be assigned on a first come first serve basis for topics and dates. The projects will involve filling the display cases on the second floor by SLC 201, SLC 275 and SLC 261. The projects will be displayed until another project replaces it. It is the student's responsibility to put up the display on the due date. The topic must come from a current scientific magazine or journal corresponding to a lecture topic and must be approved by the instructor. The project must include at least four full pages of written text and three illustrations to fill the case. Appearance is important. The text can be distributed among the illustrations. Four references must be cited. No internet references are allowed. Each Monday of the semester is available starting the week of January 23 through Monday April 30 and there are three display cases available per week. You must sign up for a date by March 2. Students can work in pairs and each student can receive 0 to 3 points added to their overall grade.

Course Outline

Click on the highlighted topic to download Powerpoint Presentations

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>CHAPTER</th>
<th>PROBLEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td></td>
<td>Definitions, Macro &amp; Micro Structures, C,N,O,Cycles, Cells</td>
</tr>
<tr>
<td>Acid/Bases/Buffers</td>
<td>1</td>
<td>Handouts Water as a solvent, Acids, Bases, buffers Power Point: Aqueous water</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>2</td>
<td>2 and handouts Structure of aldoses and ketoses Power Point: CHO</td>
</tr>
<tr>
<td>Amino Acids</td>
<td>3</td>
<td>2,5,7,9 Structures, Classification, Titration, Peptide bonds (Exclude 3.6-3.9)</td>
</tr>
<tr>
<td>Topic</td>
<td>Power Point/AminoAcids</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Proteins</td>
<td>Structures, Folding(exclude 4.11-4.15) Power Point:Protein_structure,ribo核酸se</td>
<td></td>
</tr>
<tr>
<td>Enzymes</td>
<td>Classifications</td>
<td></td>
</tr>
<tr>
<td>Enzymes</td>
<td>Michaelis-Menton kinetics, Inhibition, Regulation Power Point:PHA_Enzymes</td>
<td></td>
</tr>
<tr>
<td>Nucleic Acids Replication</td>
<td>DNA structure and replication</td>
<td></td>
</tr>
<tr>
<td>Transcription Translation</td>
<td>RNA structure, Transcription and Translation</td>
<td></td>
</tr>
<tr>
<td>Metabolism</td>
<td>Introduction to metabolism Power point:vitamins</td>
<td></td>
</tr>
<tr>
<td>Bioenergetics</td>
<td>ATP, Gibbs free energy (exclude 11.9) Bioenergetics_ATP</td>
<td></td>
</tr>
<tr>
<td>Carbohydrate Metabolism</td>
<td>Glycolysis, gluconeogenesis, &amp; glycogen metabolism</td>
<td></td>
</tr>
<tr>
<td>Mitochondria &amp; Citric Acid Cycle</td>
<td>Degradation, Synthesis, Hormonal control (exclude13.4-13.10)PDH</td>
<td></td>
</tr>
<tr>
<td>Bioenergetics</td>
<td>Redox, Free energy</td>
<td></td>
</tr>
<tr>
<td>Respiratory Complexes and ATP Synthesis</td>
<td>ECT, Proton motive force, inhibitor ElectronTransport</td>
<td></td>
</tr>
<tr>
<td>Lipid Metabolism</td>
<td>Structures, Reactions, Regulations (exclude 16.6-16.12)Lipid_Metabolism</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

42
Wilkes University Curriculum Committee
COURSE ADDITION FORM

62. Course Title: Molecular Biology

63. Course Number: ___BEGR 424 (cross list BIO 324) ___
   Coordinate with Registrar to insure course number is available

64. Total Course Credit Hours: ___3___
   Classroom Hours ___3___  Lab Hours ___3___  Other ___

65. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance into Bioengineering Program or Permission from Instructors

66. Course Description (as proposed for the Bulletin): Course descriptions provide an overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other year, or only during a set semester, note this in the description. Course descriptions should be no more than two to three sentences in length.

Insert Text Here...

An introduction to molecular biology and how it is studied. Topics covered include genome structure, transcription, translation, chromatin structure and its role in gene expression, and techniques for studying gene expression and for genetic engineering. The goal is to learn enough molecular biology to figure out how to identify target genes or combinations of genes and how they might be engineered to produce desired products or to engineer organisms with desired capabilities.
Course Description: Molecular Biology

An introduction to molecular biology and how it is studied. Topics covered include genome structure, transcription, translation, chromatin structure and its role in gene expression, and techniques for studying gene expression and for genetic engineering. The goal is to learn enough molecular biology to figure out how to identify target genes or combinations of genes and how they might be engineered to produce desired products or to engineer organisms with desired capabilities.


Instructors: Lisa Kadlec, Del Lucent, William Terzaghi
Prerequisites: Bio 121, 122, 225, 226
CHM 115, 116, 231, 232 and at least one biochemistry
PHY 201/202 or 171/174
MTH 111/112 or 111/114
MTH 150

Syllabus

WEEK 1 General introduction: basics of the central dogma
WEEK 2 DNA replication and the cell cycle
WEEK 3 Transcription and translation
WEEK 4 Studying gene expression
WEEK 5 Recombinant DNA: how and why
WEEK 5 Genome projects: how and why
WEEK 6 Genome projects: proteomics, metabolomics, etc
WEEK 7 Genome projects: what we’ve learned
WEEK 8 Regulating gene expression
WEEK 9 Chromatin structure, epigenomics
WEEK 10 Organelle genomes, Nuclear:cytoplasmic genome interactions
WEEK 11 Cell-cell interactions, cell signaling & signal transduction
WEEK 12 Genetic engineering: how and why
WEEK 13 Genetic engineering: regulatory and ethical issues
WEEK 14 Genetic engineering: case studies of successful and unsuccessful genetic engineering projects

Labs will follow and reinforce topics learned in lectures
Wilkes University Curriculum Committee
COURSE ADDITION FORM

68. Course Title: Bioinformatics
69. Course Number: ___ BEGR 430 (cross list BIO 330) ____________
   Coordinate with Registrar to insure course number is available

70. Total Course Credit Hours: ___ 3 ___
   Classroom Hours 3 ___   Lab Hours ___   Other ___

71. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance into
   Bioengineering Program or Permission from Instructors

72. Course Description (as proposed for the Bulletin): Course descriptions provide an
   overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other
   year, or only during a set semester, note this in the description. Course descriptions should
   be no more than two to three sentences in length.

   Insert Text Here...

   An introduction to the ways computers are used to make sense of biological information,
   especially the data generated by genome projects. Topics covered include databases and data mining,
   pair-wise and multiple sequence alignment, molecular phylogeny, finding genes in raw DNA
   sequences, predicting protein and RNA secondary and tertiary structures, generating and analyzing
   microarray data, generating and analyzing high-throughput sequencing data, DNA fingerprinting,
   rational drug design and metabolic simulation.

73. Required Documentation:
   Proposed Syllabus: Attach proposed syllabus immediately after this document. In
   some situations the official syllabus may contain information which is beyond the review needs
   of the Curriculum Committee (such as extensive rubrics, etc). It is permissible to attach an
   abbreviated syllabus. In general, syllabi (whether full or abbreviated) should contain the
   following information: Course Title, Course Number, Credit hours, Faculty Information
   (name contact information, office hours), Course Description, Course Outcomes or Objectives,
   Assessment (grading) informations, required texts (or other things such as tools, software, etc),
   pertinent policies and a proposed schedule of topics.

Course Description: Bioinformatics
An introduction to the ways computers are used to make sense of biological information, especially the data generated by
genome projects. Topics covered include databases and data mining, pair-wise and multiple sequence alignment,
molecular phylogeny, finding genes in raw DNA sequences, predicting protein and RNA secondary and tertiary
structures, generating and analyzing microarray data, generating and analyzing high-throughput sequencing data, DNA
fingerprinting, rational drug design and metabolic simulation. Note: This course is presently offered as Bio 330, so the
proposal is to offer it as Bio 330/430, with Master's students doing an extra project.
Text: None. Entire course is based on readings from the primary literature.
Instructors: Christian Laing, Del Lucent, William Terzaghi
Prerequisites: Bio 121, 122, 225, 226
CHM 115, 116, 231, 232 and at least one biochemistry
PHY 201/202 or 171/174
MTH 111/112 or 111/114
MTH 150

Syllabus

JAN
18-22 General introduction and data bases
25 Assignment 1 due
25-29 Data mining and sequence alignment: theory, Needleman-Wunsch algorithm, PAM and BLOSUM substitution matrices

FEB
1 Assignment 2 due
1-5 Sequence alignment programs: BLAST, FASTA, 3-D alignment, e.g. VAST and DALI
8 Assignment 3 due
8-12 Multiple alignment: Theory, CLUSTAL W, PIMA, MSA, BLOCKS, motif databases
15 Assignment 4 due
15-19 Computational phylogenetics
22 Assignment 5 due
22-26 Sequence analysis, Primer design, Constructing recombinant DNA in silico

MAR
1 Assignment 6 due
1-5 Finding genes or other distinctive sequences
8-12 Spring Break!
15 Assignment 7 due
15-19 Predicting secondary structure of RNA and protein, other protein features, intro to artificial intelligence
22 Assignment 8 due, Project 1 due
22-26 Predicting protein 3D structure
29 Assignment 9 due
29-A2 Visualizing structures: Rasmol, CN3D, etc

APR
6 Assignment 10 due
6-9 Modeling protein-ligand interactions, pharmacophores, rational drug design
12 Assignment 11 due
12-16 Microarrays & whole genome analysis
19 Assignment 12 due
19-23 Proteomics and metabolomics
26 Assignment 13 due
26-30 modeling biochemical pathways, cells and artificial life

MAY
3 Assignment 14 due
12 Project 2 due

The course will be evaluated entirely on homework assignments and projects.
There will 14 homework assignments worth 5 points each, and two projects worth 15 points each.
Projects will be similar to the homework assignments, except that you will use the skills that you have learned to solve a problem on your own.
Scale:
- 90 or more points = 4.0
- 85-89.9 = 3.5
- 80-84.9 = 3.0
- 75-79.9 = 2.5
- 70-74.9 = 2.0
- 65-69.9 = 1.5
- 60-64.9 = 1.0
- <60 = 0
Wilkes University Curriculum Committee
COURSE ADDITION FORM

74. Course Title: Bioengineering Experimentation and Analysis

75. Course Number: BEGR 501

Coordinate with Registrar to insure course number is available

76. Total Course Credit Hours: 3

Classroom Hours 3____  Lab Hours 3____  Other____

77. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance into Bioengineering Program or Permission from Instructors

78. Course Description (as proposed for the Bulletin): Course descriptions provide an overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other year, or only during a set semester, note this in the description. Course descriptions should be no more than two to three sentences in length.

Insert Text Here...

This course will provide a hands-on introduction to bioengineering. Students will use molecular techniques to genetically engineer an organism, and then evaluate how the modified organism performs using techniques for studying gene expression, biochemistry and cell physiology. They will also learn statistical procedures for evaluating the significance of their findings.
79. Required Documentation:

- **Proposed Syllabus**: Attach proposed syllabus immediately after this document. In some situations, the official syllabus may contain information which is beyond the review needs of the Curriculum Committee (such as extensive rubrics, etc.). It is permissible to attach an abbreviated syllabus. In general, syllabi (whether full or abbreviated) should contain the following information: Course Title, Course Number, Credit hours, Faculty Information (name contact information, office hours), Course Description, Course Outcomes or Objectives, Assessment (grading) informations, required texts (or other things such as tools, software, etc), pertinent policies and a proposed schedule of topics.

**Course Description: Bioengineering Experimentation and Analysis**

This course will provide a hands-on introduction to bioengineering. Students will use molecular techniques to genetically engineer an organism, and then evaluate how the modified organism performs using techniques for studying gene expression, biochemistry and cell physiology. They will also learn statistical procedures for evaluating the significance of their findings.

**Text:** Molecular biology of the cell, 5th ed. Alberts et al

Instructors: Gregory Harms, Lisa Kadlec, Del Lucent, Jeff Stratford, William Terzaghi, new chemistry hire?

Prerequisites: Bio 121, 122, 225, 226
CHM 115, 116, 231, 232 and at least one biochemistry
PHY 201/202 or 171/174
MTH 111/112 or 111/114
MTH 150

**Syllabus**

**WEEK 1** General introduction: picking a project, ethical and regulatory concerns
**WEEK 2** Identifying the organisms to modify and how to alter them
**WEEK 3** Preparing the modified enzymes/organisms
**WEEK 4** Preparing the modified enzymes/organisms
**WEEK 5** Verifying that the organisms were genetically engineered
**WEEK 6** Measuring effects of the modification on gene expression
**WEEK 7** Measuring effects of the modification on biochemistry and metabolism (assuming that the genes were modified as predicted)
**WEEK 8** Interim formal report to bio-engineering faculty. Measuring effects of the modification on cell physiology (assuming that the genes were modified as predicted)
**WEEK 9** progress report and project revisions
**WEEK 10** progress report and project revisions
**WEEK 11** progress report and project revisions
**WEEK 12** progress report and project revisions; presentation at suitable meetings
**WEEK 13** progress report and project revisions
**WEEK 14** formal report to all CSE faculty and other interested parties

48
Wilkes University Curriculum Committee
COURSE ADDITION FORM

80. Course Title: Molecular and Cellular Bioengineering

81. Course Number: ___ BEGR 502 ___ Coordinate with Registrar to insure course number is available

82. Total Course Credit Hours: ___ 3 ___
   Classroom Hours ___ 3 ___   Lab Hours ___ 3 ___   Other ___

83. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance into Bioengineering Program or Permission from Instructors

84. Course Description (as proposed for the Bulletin): Course descriptions provide an overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other year, or only during a set semester, note this in the description. Course descriptions should be no more than two to three sentences in length.

Insert Text Here...

This course will introduce students to modern concepts and techniques in bioengineering through a genuine research experience in bioengineering. Rather than following a set series of lectures, we will pick a bioengineering project and see where it leads us. We will use the information given in lectures and reading assignments to design a project, and then evaluate progress and solve problems.
85. Required Documentation:

Proposed Syllabus: Attach proposed syllabus immediately after this document. In some situations the official syllabus may contain information which is beyond the review needs of the Curriculum Committee (such as extensive rubrics, etc). It is permissible to attach an abbreviated syllabus. In general, syllabi (whether full or abbreviated) should contain the following information: Course Title, Course Number, Credit hours, Faculty Information (name contact information, office hours), Course Description, Course Outcomes or Objectives, Assessment (grading) informations, required texts (or other things such as tools, software, etc), pertinent policies and a proposed schedule of topics.

Course Description: Molecular and Cellular Bioengineering

This course will introduce students to modern concepts and techniques in bioengineering through a genuine research experience in bioengineering. Rather than following a set series of lectures, we will pick a bioengineering project and see where it leads us. We will use the information given in lectures and reading assignments to design a project, and then evaluate progress and solve problems.

Text: Molecular biology of the cell, 5th ed. Alberts et al

Instructors: Gregory Harms, Del Lucent, William Terzaghi, new chemistry hire?
Prerequisites: Bio 121, 122, 225, 226
CHM 115, 116, 231, 232 and at least one biochemistry
PHY 201/202 or 171/174
MTH 111/112 or 111/114
MTH 150

Syllabus

WEEK 1: General introduction: picking a project, ethical and regulatory concerns
WEEK 2: Developing a proposal
WEEK 3: Defending the proposal, setting up a timeline and starting the project
WEEK 4: Initial progress report and project revisions
WEEK 5: Progress report and project revisions
WEEK 5: Progress report and project revisions
WEEK 6: Progress report and project revisions
WEEK 7: Progress report and project revisions
WEEK 8: Interim formal report to bioengineering faculty
WEEK 9: Progress report and project revisions
WEEK 10: Progress report and project revisions
WEEK 11: Progress report and project revisions
WEEK 12: Progress report and project revisions; presentation at suitable meetings
WEEK 13: Progress report and project revisions
WEEK 14: Formal report to all CSE faculty and other interested parties
Wilkes University Curriculum Committee
COURSE ADDITION FORM

86. Course Title: Cellular Biophysics

87. Course Number: ___ BEGR 474 ___
   Coordinate with Registrar to insure course number is available

88. Total Course Credit Hours: ___ 3 ___
   Classroom Hours ___ 3 ___  Lab Hours ___ 3 ___  Other ___

89. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance into
   Bioengineering Program or Permission from Instructors

90. Course Description (as proposed for the Bulletin): Course descriptions provide an
   overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other
   year, or only during a set semester, note this in the description. Course descriptions should
   be no more than two to three sentences in length.

   Cells are complex micron-sized machines that may best be understood by reverse systems
   engineering, which means that the understanding originated from detailed analysis of cellular
   functions and how they were optimized. This course focuses on a quantitative understanding of
   cellular processes. It is designed for students who feel comfortable with and are interested in
   analytical and quantitative approaches to cell biology and cell physiology. Selected topics in cellular
   biophysics will be covered in depth:

   Cell mechanics: This topic includes some essential examples of kinematics and dynamics of
   cell motion and the underlying molecular processes that regulate them.

   Cell membrane and fluid dynamics: This topic includes membrane protein and lipid dynamics
   and their regulation in cellular function such as internalization processes and
   ion, fluid and molecular transport processes.

   Spectroscopy and Photophysics of Cellular Processes: This topic includes important
   photophysical processes to living systems such as light harvesting complexes, naturally
   fluorescent biomolecular compounds and photophysical phenomena in cellular systems.

   Biomolecular Physics: Along with the topic of cellular mechanics a few topics of the
   biophysics of the underlying molecules will be covered in detail.

   Biophysical Instrumentation and Modeling: Separately, this course will also cover the major
   instrumentation involved in the study of above topics and will also cover some of the major
   models describing the above processes.
91. Required Documentation:

Proposed Syllabus

Attach proposed syllabus immediately after this document. In some situations the official syllabus may contain information which is beyond the review needs of the Curriculum Committee (such as extensive rubrics, etc). It is permissible to attach an abbreviated syllabus. In general, syllabi (whether full or abbreviated) should contain the following information: Course Title, Course Number, Credit hours, Faculty Information (name contact information, office hours), Course Description, Course Outcomes or Objectives, Assessment (grading) informations, required texts (or other things such as tools, software, etc), pertinent policies and a proposed schedule of topics.

Syllabus

Lectures: 3 hours per week plus laboratory

Course work and grading: There will be weekly assignments, laboratories and quizzes. There will be one mid-term exam, a final exam and also a course project. The grading of the work will be distributed as follows: assignments – 10%, laboratories – 15%, quizzes – 10%, mid-term exam – 20%, course project – 20% and final exam – 25%.

Textbooks:

4. Biophysical Chemistry by Cantor and Shimmel

Instructors: Gregory Harms, Del Lucent

Prerequisites: Biochemistry, Molecular and Cellular Biology, Organic Chemistry, Classical Physics, Modern Physics

<table>
<thead>
<tr>
<th>Week</th>
<th>Subject</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction, Mathematics and Modeling</td>
<td>Introductory Lab</td>
</tr>
<tr>
<td>2</td>
<td>Fluid Dynamics in Biology</td>
<td>Fluid Dynamics Lab</td>
</tr>
<tr>
<td>3</td>
<td>Cell Membrane Dynamics</td>
<td>Membranes Lab</td>
</tr>
<tr>
<td>4</td>
<td>Electrophysiology</td>
<td>Electrophysiology Lab</td>
</tr>
<tr>
<td>5</td>
<td>Models of Biological Interfaces,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electrostatics, Steady-State and Transport</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kinetics</td>
<td>Computer Lab</td>
</tr>
<tr>
<td>6</td>
<td>Cell Signaling and Models</td>
<td>Computer Lab</td>
</tr>
<tr>
<td>7</td>
<td>Proteomics and Mass Spectrometry</td>
<td>Computer Lab</td>
</tr>
<tr>
<td>8</td>
<td>Multicompartment systems</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Neural Networks</td>
<td>Computer Lab</td>
</tr>
<tr>
<td>10</td>
<td>Cell transport and mechanics</td>
<td>Computer Lab</td>
</tr>
<tr>
<td>11</td>
<td>Multicellular Systems</td>
<td>Computer Lab</td>
</tr>
<tr>
<td></td>
<td>Optical Microscopy</td>
<td>Microscopy Lab</td>
</tr>
<tr>
<td></td>
<td>Imaging Techniques</td>
<td>Imaging Labs</td>
</tr>
<tr>
<td></td>
<td>Photophysics/Spectroscopy in Biology</td>
<td>Spectroscopy Lab</td>
</tr>
<tr>
<td>Page</td>
<td>Description</td>
<td>Location</td>
</tr>
<tr>
<td>------</td>
<td>-------------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>12</td>
<td>Advanced Imaging and Spectroscopy</td>
<td>Spectroscopy Lab</td>
</tr>
<tr>
<td>13</td>
<td>Protein/DNA Crystallography</td>
<td>Computer Lab</td>
</tr>
<tr>
<td>14</td>
<td>Biophysics and Disease</td>
<td></td>
</tr>
</tbody>
</table>
Wilkes University Curriculum Committee
COURSE ADDITION FORM

92. Course Title: Immunology and Immunochemistry

93. Course Number: BEGR 426 (cross list BIO 326)
Coordinate with Registrar to insure course number is available

94. Total Course Credit Hours: 3
   Classroom Hours 3  Lab Hours 3  Other

95. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance into Bioengineering Program or Permission from Instructors

96. Course Description (as proposed for the Bulletin): Course descriptions provide an overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other year, or only during a set semester, note this in the description. Course descriptions should be no more than two to three sentences in length.

   Immunology and Immunochemistry provides an introduction to mammalian host defense. The molecular mechanisms that account for the antigen-antibody interaction are explored, as are ways in which this interaction influences the evolution of lymphocyte populations. Mechanisms of acquired immunity, including interactions among lymphocyte subpopulations, are discussed. Lymphocyte differentiation is addressed as a developmental problem, and defense against infection is approached as an integrated response.
Required Documentation:

Proposed Syllabus  
Attach proposed syllabus immediately after this document. In some situations the official syllabus may contain information which is beyond the review needs of the Curriculum Committee (such as extensive rubrics, etc). It is permissible to attach an abbreviated syllabus. In general, syllabi (whether full or abbreviated) should contain the following information: Course Title, Course Number, Credit hours, Faculty Information (name contact information, office hours), Course Description, Course Outcomes or Objectives, Assessment (grading) informations, required texts (or other things such as tools, software, etc), pertinent policies and a proposed schedule of topics.

BEGR 426

IMMUNOLOGY AND IMMUNOCHEMISTRY

Kenneth Pidcock, instructor  
SLC Room 302  
408-4766 (office); 287-5780 (home); 540-0518 (personal)  
kenneth.pidcock@wilkes.edu  
Office hours as posted


Class periods:  
Lecture, Tuesday and Thursday, 9:30 - 10:45, SLC 359  
Laboratory, Monday, 14:00 - 17:00, SLC 305

You raise up your head and you ask, Is this where it is?  
And somebody points to you and says, It’s his.  
And you say, What’s mine?  
And somebody else says, Where what is?  
And you say, Oh my God, am I here all alone?  
Because something is happening here but you don’t know what it is, do you, Mr. Jones?

Bob Dylan, Ballad of a Thin Man

55
Kenneth Pidcock, instructor
SLC Room 302
408-4766 (office); 287-5780 (home); 540-0518 (personal)
kenneth.pidcock@wilkes.edu
Office hours as posted


Class periods: Lecture, Tuesday and Thursday, 9:30 - 10:45, SLC 359
Laboratory, Monday, 14:00 - 17:00, SLC 305

You raise up your head and you ask, Is this where it is?
And somebody points to you and says, It’s his.
And you say, What’s mine?
And somebody else says, Where what is?
And you say, Oh my God, am I here all alone?
Because something is happening here but you don’t know what it is, do you, Mr. Jones?

Bob Dylan, Ballad of a Thin Man

Immunology is one of the youngest of biological disciplines, arising at the end of the 19th century from observations in microbiology and invertebrate physiology suggesting that animals may possess mechanisms to identify pathogenic microorganisms and to interfere with development of infectious disease. (This history has led to a somewhat artificial association between immunology and microbiology. If you teach in the future, your students may be perplexed to learn that you were taught immunology by a bacteriologist, in the same manner that you may be perplexed to learn that I was taught molecular biology by a physicist. As currently understood, immunology exhibits conceptual affinity to endocrinology and neurology in that all involve homeostatically regulated populations of cells exchanging information in the form of chemical signals.) The focus of immunology, as routinely studied, is the cells and molecules involved in specific host defense of homeothermic vertebrates. As we’ve learned more about those cells and molecules, the scope and complexity of immunology has expanded. (Which may seem unfair to you. However, with greater complexity has come greater clarity. Simply put, immunology makes a lot more sense than it did even a few years ago.)

The lecture sequence follows that put forth in Professor Roitt’s outstanding monograph. Following a discussion of mechanisms of innate immunity, focused on phagocytosis, complement activation and the acute inflammatory response, the macromolecules involved in specific immunity (immunoglobulins, T cell receptors, MHC proteins) are introduced. The molecular mechanisms that account for the antigen-antibody interaction are explored, as are ways in which this interaction influences the evolution of lymphocyte populations. Mechanisms of acquired immunity, including interactions among lymphocyte subpopulations and idiootype networks, are discussed. Lymphocyte differentiation is addressed as a developmental problem, and defense against infection is approached as an integrated response. The lecture sequence

56
concludes with a discussion of immune mechanisms in disease processes - immunodeficiencies and hypersensitivities.

Because immunochemistry involves manipulation of proteins (the immunoglobulins), the laboratory portion of Biology 326 introduces students to a variety of biotechnologies, including protein purification, liquid chromatography, protein modification, and electrophoresis. Students become familiar with assays for antigen detection and quantitation, including immunodiffusion, affinity chromatography, and Western blotting.

SPECIFIC OBJECTIVES

Students will

1. identify principle host defenses used by mammals against invasive pathogens. This is assessed by written examination, and supports Pennsylvania Department of Education Biology Content Standard I.D., “Structure, function and development of organisms”.
2. discuss specific immunity as a means to provide specificity, amplification, and memory to host defenses. This is assessed by written examination, and supports Pennsylvania Department of Education Biology Content Standard I.D., “Structure, function and development of organisms”.
3. outline structures of the major cell surface proteins - immunoglobulins, MHC complex proteins, and T cell receptors - involved in specific immunity. This is assessed by written examination, and supports Pennsylvania Department of Education Biology Content Standard I.D., “Structure, function and development of organisms”.
4. associate the antigen-antibody interaction with other macromolecular interactions in living systems. This is assessed by written examination, and supports Pennsylvania Department of Education Biology Content Standard I.B., “Molecular and cellular biology and the chemical basis of life”.
5. locate the tissues and cell types involved with the specific immune response. This is assessed by written examination, and supports Pennsylvania Department of Education Biology Content Standard I.D., “Structure, function and development of organisms”.
6. diagram the components of specific immunity as a self-regulated network. This is assessed by written examination, and supports Pennsylvania Department of Education Biology Content Standard I.D., “Structure, function and development of organisms”.
7. outline the sequence of lymphocyte development and differentiation, and associate unregulated development with lymphoproliferative disorders. This is assessed by written examination, and supports Pennsylvania Department of Education Biology Content Standard I.D., “Structure, function and development of organisms”.
8. relate the acquired immune response of mammals to the evolutionary history of self-recognition systems. This is assessed by written examination, and supports Pennsylvania Department of Education Biology Content Standard I.E., “Ecological relationships among populations, communities and ecosystems”.
9. recognize the dynamics of host responses to infection by bacteria, viruses and parasites. This is assessed by written examination, and supports Pennsylvania Department of Education Biology Content Standard I.E., “Ecological relationships among populations, communities and ecosystems”.

57
10. understand current approaches to vaccination. This is assessed by written examination, and supports Pennsylvania Department of Education Biology Content Standard I.F., “Technological and commercial issues and applications of biological systems”.

11. discuss the impact of immunology on contemporary medical issues, including immunodeficiencies, hypersensitivities, and transplantation medicine. This is assessed by written examination, and supports Pennsylvania Department of Education Biology Content Standards I.F., “Technological and commercial issues and applications of biological systems”, and I.G., “Implications of scientific and technological developments on ethical questions relating to biology”.

12. conduct procedures for protein purification, including salting out, dialysis, ion exchange chromatography, and gel filtration. (laboratory) This is assessed by formal laboratory report, and supports Pennsylvania Department of Education Biology Content Standard I.B., “Molecular and cellular biology and the chemical basis of life”.

13. demonstrate competence with immunoassays, including double diffusion assays and immunoelectrophoresis (laboratory) This is assessed by formal laboratory report.

14. employ prepared immunochemical reagents for detection of specific antigen in natural material. (laboratory) This is assessed by formal laboratory report.

EVALUATION

Grading in Biology 326 is determined by achievement in formal lecture examinations and by overall performance in the laboratory, according to the following distribution:

- First Hour Examination (lectures 1-9): 15%
- Second Hour Examination (lectures 10-19): 20%
- Third Hour Examination (lectures 20-28): 20%
- Final Examination (cumulative): 25%
- Laboratory Grade: 20%

Hour examinations will be of mixed format. The final examination will assess students’ ability to teach from textbook figures. The laboratory grade will be based on laboratory reports and on instructor evaluation of student performance in the laboratory. In no case will students achieving the following percentage grades receive a grade lower than that in parentheses: 94 (4.0), 88 (3.5), 82 (3.0), 76 (2.5), 70 (2.0), 64 (1.5), 60 (1.0).

ATTENDANCE

Consistent with Wilkes University policy, attendance at all lectures and laboratory sessions is mandatory. The instructor recognizes that the advanced students enrolled in Biology 326 may have academic responsibilities (interviews, meeting presentations, workshops) that interfere with lecture attendance. Professional courtesy requires that students provide notice prior to the period affected and documentation in support of any necessary absence. Examinations and laboratory work will be made up at the discretion of the instructor.

LABORATORY POLICY

It is imperative that students read all exercises and supplementary materials, and develop a plan for execution of the experiments, prior to the scheduled laboratory period. The difficulties in
attending to this practice, given the immediate demands on the time of science and premedical majors, are recognized by the instructor: nevertheless, its importance cannot be overstated.

As in all laboratory situations, safe practice is critical to the protection of the student and her colleagues, as well as to the proper execution of experiments. Treat all materials as if they are toxic; many of them are. Take care to avoid exposure to samples and reagents and report all spills to the instructor.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 17</td>
<td>Lecture 1: Innate Immunity - Physical barriers to infection; phagocytosis</td>
<td>Chapter 1, pp. 1-17</td>
</tr>
<tr>
<td>January 19</td>
<td>Lecture 2: Innate Immunity - Complement activation; inflammation; extracellular killing</td>
<td>Chapter 1, pp. 17-32</td>
</tr>
<tr>
<td>January 24</td>
<td>Lecture 3: Specific Acquired Immunity - Clonal selection; acquired immunity; cell-mediated immunity</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>January 26</td>
<td>Lecture 4: Antibodies - Structure of immunoglobulins and immunoglobulin genes</td>
<td>Chapter 3, pp. 53-60</td>
</tr>
<tr>
<td>January 31</td>
<td>Lecture 5: Antibodies - Structure-function relationships; immunoglobulin classes and subclasses; receptor chain recombination</td>
<td>Chapter 3, pp. 60-76</td>
</tr>
<tr>
<td>February 2</td>
<td>Lecture 6: Membrane Receptors - Surface immunoglobulins; T cell receptors; generation of antigen-binding diversity</td>
<td>Chapter 4, pp. 79-99</td>
</tr>
<tr>
<td>February 7</td>
<td>Lecture 7: Membrane receptors - The Major Histocompatibility Complex</td>
<td>Chapter 4, pp. 99-110</td>
</tr>
<tr>
<td>February 9</td>
<td>Lecture 8: Primary Interaction with Antigen - Antigen determinants: binding mechanisms; avidity and specificity; TCR recognition</td>
<td>Chapter 5, pp. 113-124</td>
</tr>
<tr>
<td>February 14</td>
<td><strong>First Hour Examination (lectures 1-7)</strong></td>
<td></td>
</tr>
<tr>
<td>February 16</td>
<td>Lecture 9: Primary Interaction with Antigen - Processing of antigen for MHC presentation; the nature of T cell epitopes; γδ T cells; superantigens</td>
<td>Chapter 5, pp. 124-137</td>
</tr>
<tr>
<td>February 21</td>
<td>Lecture 10: The Anatomy of the Immune Response</td>
<td>Chapter 7</td>
</tr>
<tr>
<td>February 23</td>
<td>Lecture 11: Lymphocyte Activation - T cell activation</td>
<td>Chapter 8, pp. 205-219</td>
</tr>
<tr>
<td>February 28</td>
<td>Lecture 12: Lymphocyte Activation - B cell activation</td>
<td>Chapter 8, pp. 219-224</td>
</tr>
<tr>
<td>March 1</td>
<td>Lecture 13: Production of Effectors - Cytokine activities and networks; T cell polarization</td>
<td>Chapter 9, pp. 226-243</td>
</tr>
<tr>
<td>March 13</td>
<td>Lecture 14: Production of Effectors - Activation of cytotoxic T cells and B cells: lymphocyte memory</td>
<td>Chapter 9, pp. 243-258</td>
</tr>
<tr>
<td>March 15</td>
<td>Lecture 15: Control Mechanisms - Feedback regulation; regulatory T cells; idioype networks</td>
<td>Chapter 10, pp. 263-274</td>
</tr>
<tr>
<td>March 20</td>
<td><strong>Second Hour Examination (lectures 8-14)</strong></td>
<td>Chapter 10, pp. 274-281</td>
</tr>
<tr>
<td>March 22</td>
<td>Lecture 16: Control Mechanisms - Genetic and neuroendocrine factors</td>
<td></td>
</tr>
</tbody>
</table>

59
<table>
<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 27</td>
<td>Lecture 17: Development of the Immune Response - T cell differentiation and ontogeny</td>
<td>Chapter 11, pp. 283-293</td>
</tr>
<tr>
<td>March 29</td>
<td>Lecture 18: Development of the Immune Response - T cell tolerance</td>
<td>Chapter 11, pp. 293-297</td>
</tr>
<tr>
<td>April 3</td>
<td>Lecture 19: Development of the Immune Response - B cell differentiation; evolution of the immune response</td>
<td>Chapter 11, pp. 297-307</td>
</tr>
<tr>
<td>April 10</td>
<td>Lecture 20: Adversarial Strategies During Infection - Defense against extracellular and intracellular bacteria</td>
<td>Chapter 12, pp. 313-330</td>
</tr>
<tr>
<td>April 12</td>
<td>Lecture 21: Adversarial Strategies During Infection - Defense against viruses and eukaryotes</td>
<td>Chapter 12, pp. 330-341</td>
</tr>
<tr>
<td>April 17</td>
<td>Lecture 22: Prophylaxis - Vaccines and other immunotherapies</td>
<td>Chapter 13</td>
</tr>
<tr>
<td>April 19</td>
<td><strong>Third Hour Examination (lectures 15-21)</strong></td>
<td></td>
</tr>
<tr>
<td>April 24</td>
<td>Lecture 23: Immunodeficiencies</td>
<td>Chapter 14</td>
</tr>
<tr>
<td>April 26</td>
<td>Lecture 24: Hypersensitivities</td>
<td>Chapter 15</td>
</tr>
<tr>
<td>May 1</td>
<td>Lecture 25: Transplant Biology</td>
<td>Chapter 16</td>
</tr>
<tr>
<td>Date</td>
<td>Exercises</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>January 16</td>
<td>Characterization of anti-glucose oxidase antiserum for protein content and antibody titer</td>
<td></td>
</tr>
<tr>
<td>January 23</td>
<td>Isolation of γ globulin from anti-glucose oxidase antiserum by ammonium sulfate precipitation</td>
<td></td>
</tr>
<tr>
<td>January 30</td>
<td>Isolation of IgG from anti-glucose oxidase γ globulin by anion exchange chromatography</td>
<td></td>
</tr>
<tr>
<td>February 6</td>
<td>Analysis of fractions from IgG isolation for protein and antibody content</td>
<td></td>
</tr>
<tr>
<td>February 13</td>
<td>SDS polyacrylamide gel electrophoresis analysis of antiserum, γ globulin and IgG</td>
<td></td>
</tr>
<tr>
<td>February 20</td>
<td>Immunochemical analysis of antiserum, γ globulin and IgG</td>
<td></td>
</tr>
<tr>
<td>February 27</td>
<td>Preparation of a glucose oxidase affinity resin</td>
<td></td>
</tr>
<tr>
<td>March 12</td>
<td>Purification of anti-glucose oxidase IgG by affinity chromatography</td>
<td></td>
</tr>
<tr>
<td>March 19</td>
<td>Peroxidase labeling of affinity-purified anti-glucose oxidase IgG</td>
<td></td>
</tr>
<tr>
<td>March 26</td>
<td>Analysis of affinity-purified glucose oxidase by dot blotting</td>
<td></td>
</tr>
<tr>
<td>April 2</td>
<td>Western blotting</td>
<td></td>
</tr>
<tr>
<td>April 16</td>
<td>Preparation of microtiter plates for glucose oxidase ELISA</td>
<td></td>
</tr>
<tr>
<td>April 23</td>
<td>Glucose oxidase ELISA</td>
<td></td>
</tr>
<tr>
<td>April 30</td>
<td>Immunohistochemistry</td>
<td></td>
</tr>
</tbody>
</table>

To practice technical writing, five of these exercises (January 16; January 23; January 30/February 6; February 13; and February 20) will be written up as formal scientific reports. Drafts of each are due two weeks after completion of procedures.
Wilkes University Curriculum Committee
COURSE ADDITION FORM

98. Course Title: Medical Microbiology

99. Course Number: __ BEGR 427 (cross list BIO 327) __
Coordinate with Registrar to insure course number is available

100. Total Course Credit Hours: __3__
Classroom Hours __3__
Lab Hours __3__
Other ___________

101. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance into Bioengineering Program or Permission from Instructors

102. Course Description (as proposed for the Bulletin): Course descriptions provide an overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other year, or only during a set semester, note this in the description. Course descriptions should be no more than two to three sentences in length.

Medical Microbiology provides a professional-level introduction to microbiology that is focused on application of microbiology to the study of infectious disease. Principles of molecular cell biology and biochemistry are applied to an understanding of factors influencing interactions between microbial pathogens and their hosts. Adaptations that have evolved in vertebrate hosts to limit infection are considered along with parasite adaptations that have evolved to overcome such defenses. Infection control strategies - epidemiological and chemical - are also introduced.
103. Required Documentation:

Proposed Syllabus  
Attach proposed syllabus immediately after this document. In
some situations the official syllabus may contain information which is beyond the review needs
of the Curriculum Committee (such as extensive rubrics, etc). It is permissible to attach an
abbreviated syllabus. In general, syllabi (whether full or abbreviated) should contain the
following information: Course Title, Course Number, Credit hours, Faculty Information
(name contact information, office hours), Course Description, Course Outcomes or Objectives,
Assessment (grading) informations, required texts (or other things such as tools, software, etc),
pertinent policies and a proposed schedule of topics.

BEGR 426 Medical Microbiology
Syllabus

Kenneth Pidcock, instructor
Office: SLC 302
phone 408-4766 (office); 287-5780 (home); 540-0518 (personal)
e-mail, kenneth.pidcock@wilkes.edu
Office Hours: Monday, Wednesday, Friday 11:30 - 12:30; Tuesday, Thursday 13:00 - 14:00

Required texts:

Goering, R., H. Dockrell, I.Roitt, M. Zuckerman, and D. Wakelin. 2008. Mims' Medical


Class periods

Lecture:  
Tuesday and Thursday 9:30-10:45, Breiseth 107

Laboratory:
Monday 8:30 - 11:20, SLC 305 (L1)
Wednesday 8:30 - 11:20, SLC 305 (L2)
Friday 8:30 - 11:20, SLC 305 (L3)
Required texts:


Class periods

Lecture: Tuesday and Thursday 9:30-10:45, Breiseth 107
Laboratory: Monday 8:30 - 11:20, SLC 305 (L1)
            Wednesday 8:30 - 11:20, SLC 305 (L2)
            Friday 8:30 - 11:20, SLC 305 (L3)

SCOPE AND SEQUENCE

Medical Microbiology provides a professional-level introduction to microbiology that is focused on application of microbiology to the study of infectious disease.

It is assumed that students enrolled in Medical Microbiology have previously received no formal instruction in microbiology, but do possess a solid foundation in the principles of molecular cell biology and biological chemistry. Those principles are applied to an understanding of factors influencing interactions between microbial pathogens and their hosts. Adaptations that have evolved in vertebrate hosts to limit infection are considered along with parasite adaptations that have evolved to overcome such defenses. Infection control strategies - epidemiological and chemical - are also introduced.

The laboratory exercises of Medical Microbiology follow a traditional sequence for laboratory microbiology. After mastering techniques for cultivation of microorganisms, students are introduced to methods for microscopic examination of bacterial structure. A variety of physical and biochemical tests are employed for differentiating and identifying microbial groups. Additional laboratory exercises address chemical control of bacterial growth, and analysis of horizontal gene transfer.
SPECIFIC OBJECTIVES

Students will

1. relate structural and metabolic features of microorganisms to parasitic strategies. This is assessed by examination.
2. relate mechanisms for metabolic regulation to the machinery of genetic expression in bacteria. This is assessed by examination.
3. outline routes of transmission for important viral and bacterial infectious diseases. This is assessed by examination.
4. identify major physiological features involved with mammalian host defense. This is assessed by examination.
5. identify molecular strategies used by pathogenic bacteria to overcome mammalian host defenses. This is assessed by examination.
6. demonstrate techniques for aseptic handling of bacteria in the microbiology laboratory. This is assessed by written report.
7. prepare bacterial cultures for differential microscopic observation. This is assessed by written report.
8. prepare dichotomous keys and employ metabolic assays for systematic identification of bacterial cultures. This is assessed by written report.
9. analyze the role of horizontal transfer on the evolution of bacteria and spread of antibiotic resistance. This is assessed by examination and by notebook review.

EVALUATION

Grading in Medical Microbiology is determined by achievement in formal lecture examinations and by overall performance in the laboratory, according to the following distribution:

<table>
<thead>
<tr>
<th>Examination</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>First hour examination</td>
<td>20%</td>
</tr>
<tr>
<td>Second hour examination</td>
<td>20%</td>
</tr>
<tr>
<td>Third hour examination</td>
<td>20%</td>
</tr>
<tr>
<td>Final examination</td>
<td>25%</td>
</tr>
<tr>
<td>Laboratory grade</td>
<td>15%</td>
</tr>
</tbody>
</table>

Hour exams will be multiple-choice. Final exam will combine an hour exam on material covered after the third hour exam with comprehensive essays. The laboratory grade will be based on quizzes (40%), evaluation of students' laboratory notebooks (20%), and a formal report on identification of unknown cultures (40%).

The final grade distribution will be determined by the instructor; in no case will students achieving the following percentage grades receive a grade lower than that in parentheses: 94 (4.0), 88 (3.5), 82 (3.0), 76 (2.5), 70 (2.0), 64 (1.5), 60 (1.0).
ATTENDANCE

Consistent with Wilkes policy, attendance at all lectures and laboratory sessions is mandatory. The instructor recognizes that the advanced students enrolled in Medical Microbiology may have academic responsibilities (interviews, workshops) that interfere with lecture attendance. Professional courtesy requires that students provide notice prior to the period affected and documentation in support of any necessary absence. Examinations and laboratory work can only be made up at the discretion of the instructor.

LABORATORY POLICY

Because of the detail involved in execution of laboratory experiments in microbiology, it is imperative that students read all exercises and supplementary material prior to the scheduled period and develop a plan for execution of the experiments. The importance of this practice will become clear as students attempt to negotiate the complex procedures involved.

Safe laboratory practice is particularly important in the microbiology laboratory, as the student may be dealing with pathogenic material. Safety issues will be addressed throughout the laboratory sessions, but the following points are particularly relevant:

1. Treat all cultures as if they are invasive pathogens. This means consistent use of aseptic technique and procedures to avoid exposure. Contamination should be reported to the instructor for immediate disinfection.

2. Protect yourself and your belongings from contamination: Leave personal belongings away from the work area, don’t eat, drink or smoke in the laboratory, and wear a lab coat or lab apron to prevent spills on your clothing.

3. As with any laboratory, students in Medical Microbiology are required to wear safety glass while in the laboratory.

All laboratory notes and observations are to be recorded in a laboratory notebook dedicated to the course.
<table>
<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 30</td>
<td>Lecture 1: Introduction to infectious disease biology; the nature of parasitism</td>
<td>Intro; Chpt 1; Chpt 8, 66-77</td>
</tr>
<tr>
<td>September 1</td>
<td>Lecture 2: Bacterial structure and growth</td>
<td>Chapter 2, 15-20</td>
</tr>
<tr>
<td>September 6</td>
<td>Lecture 3: Bacterial gene expression</td>
<td>Chapter 2, 20-24</td>
</tr>
<tr>
<td>September 8</td>
<td>Lecture 4: Genetic change in bacteria; mutation and horizontal transfer</td>
<td>Chapter 2, 24-32</td>
</tr>
<tr>
<td>September 13</td>
<td>Lecture 5: Introduction to virus biology; viral multiplication strategies</td>
<td>Chapter 3, 37-42</td>
</tr>
<tr>
<td>September 15</td>
<td>Lecture 6: Outcomes of viral infection</td>
<td>Chapter 3, 42-46</td>
</tr>
<tr>
<td>September 20</td>
<td>Lecture 7: Eukaryotic parasites; the normal microbiota</td>
<td>Chpts 4-7; Chpt 8, 63-66</td>
</tr>
<tr>
<td>September 22</td>
<td>Lecture 8: Innate defense - Physical and chemical barriers, phagocytosis</td>
<td>Chapter 9, 77-83</td>
</tr>
<tr>
<td>September 27</td>
<td>Lecture 9: Innate defense - Complement, acute phase proteins, interferons, cytotoxicity</td>
<td>Chapter 9, 83-90</td>
</tr>
<tr>
<td>September 29</td>
<td>First Hour Examination (lectures 1-7)</td>
<td></td>
</tr>
<tr>
<td>October 4</td>
<td>Lecture 10: Adaptive immunity - Roles of antibodies and T lymphocytes</td>
<td>Chapter 10, 93-99</td>
</tr>
<tr>
<td>October 6</td>
<td>Lecture 11: Adaptive immunity - Coordinated defense against parasites</td>
<td>Chapter 10, 99-102</td>
</tr>
<tr>
<td>October 11</td>
<td>Lecture 12: Development and regulation of adaptive immunity</td>
<td>Chapter 11</td>
</tr>
<tr>
<td>October 18</td>
<td>Lecture 13: Background to the infectious disease process</td>
<td>Chapter 12</td>
</tr>
<tr>
<td>October 20</td>
<td>Lecture 14: Pathogen transmission - Sites of entry</td>
<td>Chapter 13, 129-136</td>
</tr>
<tr>
<td>October 25</td>
<td>Lecture 15: Pathogen transmission - Exit and transmission</td>
<td>Chapter 13, 136-147</td>
</tr>
<tr>
<td>Date</td>
<td>Topics</td>
<td>Reading</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------------------------------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>October 27</td>
<td>Second Hour Examination (lectures 8-13)</td>
<td></td>
</tr>
<tr>
<td>November 1</td>
<td>Lecture 16: Spread of systemic infections</td>
<td>Chapter 15</td>
</tr>
<tr>
<td>November 3</td>
<td>Lecture 17: Parasite persistence</td>
<td>Chapter 16</td>
</tr>
<tr>
<td>November 8</td>
<td>Lecture 18: Pathology of infections - Toxins and immunopathologies</td>
<td>Chapter 17, 191-196</td>
</tr>
<tr>
<td>November 10</td>
<td>Lecture 19: Pathology of infections - Hypersensitivities and malignancies</td>
<td>Chapter 17, 196-208</td>
</tr>
<tr>
<td>November 15</td>
<td>Lecture 20: Strategies for infection control</td>
<td>Chapter 31</td>
</tr>
<tr>
<td>November 17</td>
<td>Lecture 21: Diagnostic microbiology</td>
<td>Chapter 32</td>
</tr>
<tr>
<td>November 22</td>
<td>Third Hour Examination (lectures 14-19)</td>
<td></td>
</tr>
<tr>
<td>November 29</td>
<td>Lecture 22: Antimicrobial agents: Principles and resistance; bacterial cell wall synthesis inhibitors</td>
<td>Chapter 33, 479-490</td>
</tr>
<tr>
<td>December 1</td>
<td>Lecture 23: Antibacterial agents: Protein and nucleic acid synthesis inhibitors</td>
<td>Chapter 33, 490-503</td>
</tr>
<tr>
<td>December 6</td>
<td>Lecture 24: Antimicrobial agents: Antimycobacterial, antifungal and antiviral drugs</td>
<td>Chapter 33, 503-517</td>
</tr>
<tr>
<td>December 8</td>
<td>Lecture 25: Vaccination</td>
<td>Chapter 34</td>
</tr>
<tr>
<td>Date</td>
<td>Exercise</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>August 29 (L1)</td>
<td>Introduction to the microbiology laboratory; aseptic technique; oxygen relations</td>
<td></td>
</tr>
<tr>
<td>August 31 (L2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>September 2 (L3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>September 7 (L2)</td>
<td>Culture purification by streak plating; selective and differential media</td>
<td></td>
</tr>
<tr>
<td>September 9 (L3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>September 12 (L1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>September 14 (L2)</td>
<td>Microscopy in bacteriology; the Gram stain; structural stains</td>
<td></td>
</tr>
<tr>
<td>September 16 (L3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>September 19 (L1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>September 21 (L2)</td>
<td>Antimicrobial agent susceptibility testing and resistance; disinfectants</td>
<td></td>
</tr>
<tr>
<td>September 23 (L3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>September 26 (L1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>September 28 (L2)</td>
<td>Survey of clinically-significant bacteria: <em>Staphylococcus</em></td>
<td></td>
</tr>
<tr>
<td>September 30 (L3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>October 3 (L1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>October 5 (L2)</td>
<td>Survey of clinically-significant bacteria: <em>Streptococcus</em> and <em>Enterococcus</em></td>
<td></td>
</tr>
<tr>
<td>October 7 (L3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>October 10 (L1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>October 17 (L1)</td>
<td>Survey of clinically-significant bacteria: the <em>Enterobacteriaceae</em></td>
<td></td>
</tr>
<tr>
<td>October 19 (L2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>October 21 (L3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>October 24 (L1)</td>
<td>Survey of clinically-significant bacteria: Non-enteric Gram-negative bacteria</td>
<td></td>
</tr>
<tr>
<td>October 26 (L2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>October 28 (L3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>October 31 (L1)</td>
<td>Water quality microbiology (MPN and membrane methods); isolation of antibiotic-resistant bacteria</td>
<td></td>
</tr>
<tr>
<td>November 2 (L2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>November 4 (L3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>November 7 (L1)</td>
<td>Identification strategies in diagnostic bacteriology; metabolic and molecular identification</td>
<td></td>
</tr>
<tr>
<td>November 9 (L2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>November 11 (L3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>November 14 (L1)</td>
<td>Extrachromosomal genetics: Horizontal transfer of antibiotic resistance from aquatic coliforms</td>
<td></td>
</tr>
<tr>
<td>November 16 (L2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>November 18 (L3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>November 28 (L1)</td>
<td>Completion of unknown identification; phenotypic analysis of drug-resistant coliforms</td>
<td></td>
</tr>
<tr>
<td>November 30 (L2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>December 2 (L3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>December 5 (L1)</td>
<td>Molecular microbiology: Isolation of plasmids from aquatic coliforms and transconjugants</td>
<td></td>
</tr>
<tr>
<td>December 7 (L2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>December 9 (L3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

69
104. Course Title: Virology

105. Course Number: _ BEGR 429 (cross list with BIO 329 ) ___
    Coordinate with Registrar to insure course number is available

106. Total Course Credit Hours: ___3____
    Classroom Hours 3____  Lab Hours 3____  Other_____

107. Course Prerequisites: Undergraduate Degree in Engineering or Science and Acceptance
    into Bioengineering Program or Permission from Instructors

108. Course Description (as proposed for the Bulletin): Course descriptions provide an
    overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other
    year, or only during a set semester, note this in the description. Course descriptions should
    be no more than two to three sentences in length.
    
    Virology provides an introduction to the biology of viruses and virus-like agents. A
    consideration of viruses in terms of their molecular architecture and genome organization is
    followed by a survey of strategies employed for reproductive success of viruses, focused on the
    traditional "stages" of attachment, entry, transcription, translation, genome replication, assembly and
    release. The course provides an overview of the major groups in the Baltimore classification, and introduces
    topics in host interaction and control.
109. Required Documentation:

Proposed Syllabus  
Attach proposed syllabus immediately after this document. In some situations the official syllabus may contain information which is beyond the review needs of the Curriculum Committee (such as extensive rubrics, etc). It is permissible to attach an abbreviated syllabus. In general, syllabi (whether full or abbreviated) should contain the following information: Course Title, Course Number, Credit hours, Faculty Information (name contact information, office hours), Course Description, Course Outcomes or Objectives, Assessment (grading) informations, required texts (or other things such as tools, software, etc), pertinent policies and a proposed schedule of topics.

BEGR 429 VIROLOGY
Suggested Syllabus

Kenneth Pidcock, instructor
SLC Room 302
408-4766 (office); 287-5780 (home); 540-0518 (personal)
kenneth.pidcock@wilkes.edu
Office hours as posted


Class periods: Tuesdays and Thursdays, 8:00 - 9:15, SLC 359

As one moves down the size spectrum of organisms, from the romantic large mammals and birds, through nondescript small arthropods, on down to protozoan, bacterial and viral species, not only does concern for diversity and conservation fall away, it even changes sign. (Robert M. May)

Safecrackers. They're all safecrackers. (Dickson Despommier)

A virus walks into a bar. The bartender says, "We don't serve viruses in this bar." The virus says, "Now we do." (Brian Malow)
Kenneth Pidcock, instructor
SLC Room 302
408-4766 (office); 287-5780 (home); 540-0518 (personal)
kenneth.pidcock@wilkes.edu
Office hours as posted


Class periods: Tuesdays and Thursdays, 8:00 - 9:15, SLC 359

As one moves down the size spectrum of organisms, from the romantic large mammals and birds, through nondescript small arthropods, on down to protozoan, bacterial and viral species, not only does concern for diversity and conservation fall away, it even changes sign (Robert M. May)

Safecrackers. They’re all safecrackers. (Dickson Despommier)

A virus walks into a bar. The bartender says, “We don’t serve viruses in this bar.” The virus says, “Now we do.” (Brian Malow)

In everyday conversation, a virus is any infectious microorganism, and it is not uncommon to read off, for example, the “anthrax virus”. (The confusion cuts both ways. In a Newsweek column some years ago, George Will referred to “smallpox spores”.) In biology, a virus is an obligate intracellular parasite with a reproductive cycle involving eclipse (a period of time during which infectious units are lacking), and intercellular transmission involving nucleoprotein particles. Unlike other taxonomic groups, viruses do not share a phylogenetic origin; rather, it is understood that different groups of viruses are of independent origin. By convention, viruses are classified by genomic structure, and we will follow the traditional Baltimore classification for the course.

Interest in virology arises naturally from the impact of viruses on human health. Throughout history, viral infections have been a major source of human morbidity and mortality, and viral diseases continue to emerge (e.g., West Nile Virus). In addition, because viruses depend on the cellular physiology of their hosts, study of viral multiplication provides important insight into host biology. It is worth remembering that the study of virus biology has always been, and remains, fundamental our understanding of molecular genetics.

The lecture sequence of Virology follows the sequence of topics presented in The Carter and Saunders monograph. A consideration of viruses in terms of their molecular architecture and genome organization is followed by a survey of strategies employed for reproductive success of viruses, focused on the traditional “stages” of attachment, entry, transcription, translation, genome replication, assembly and release. The course provides an overview of the major groups in the Baltimore classification, and introduces topics in host interaction and control.
SPECIFIC OBJECTIVES

During completion of Virology, students will

1. identify structural components of infectious virions and the contributions of these structures to viral reproductive success. This is assessed by written examination and supports Pennsylvania Department of Education Biology Content Standard I.D., “Structure, function and development of organisms”.

2. compare genomic organization of major groups of human viruses. This is assessed by written examination, and supports Pennsylvania Department of Education Biology Content Standard I.C., “Classical and molecular genetics and the evolution and diversity of life”.

3. outline stages in viral multiplication, and identify variations in strategies used by different viral groups. This is assessed by written examination, and supports Pennsylvania Department of Education Biology Content Standard I.C., “Classical and molecular genetics and the evolution and diversity of life”.

4. discuss molecular mechanisms for regulating expression of viral genes to optimize viral reproductive success. This is assessed by written examination, and supports Pennsylvania Department of Education Biology Content Standard I.C., “Classical and molecular genetics and the evolution and diversity of life”.

5. identify host adaptations to resist viral multiplication, along with viral strategies to overcome these defenses. This is assessed by written examination and supports Pennsylvania Department of Education Biology Content Standard I.D., “Structure, function and development of organisms”.

6. appreciate the impact of viral infection on human health, and associate viral multiplication strategies with technological approaches to prevention and control of viral infection. This is assessed by written examination and oral presentation, and supports Pennsylvania Department of Education Biology Content Standard I.E., “Ecological relationships among populations, communities and ecosystems”.

7. learn to read and analyze the primary literature of virology. This is assessed by oral presentation.

EVALUATION

Grading in Virology is determined by performance on formal lecture examinations, and by effective instruction in student presentations, according the following distribution:

- First Hour Examination (chapters 1-5): 20%
- Second Hour Examination (chapters 6-9): 25%
- Third Hour Examination (chapters 10-16): 25%
- Final Examination: 30%

Hour examinations will be of mixed format (40% multiple choice, 60% narrative). In no case will students achieving the following percentage grades receive a grade lower than that in parentheses: 94 (4.0), 88 (3.5), 82 (3.0), 76 (2.5), 70 (2.0), 64 (1.5), 60 (1.0).