Wilkes University Curriculum Committee

PROPOSAL SUBMITTAL FORM

1. Originator:  
   1. Gregory S. Harms  
      Department of Electrical Engineering and Physics, Department of Biology  
      Tel: 570-408-4828  
      E-mail: gregory.harms@wilkes.edu

   2. William Terzaghi  
      Department of Biology  
      Tel: 570-408-4762  
      E-mail: william.terzaghi@wilkes.edu

2. Proposal Title: Minor Revisions to the 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”).

   ☐ New Program. (Major or Minor Degree 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:

__3____ Course Addition Form (plus syllabi)
______ Course Deletion Form
_______ Course Change Form

5. Executive Summary of Proposal.

Multiple departments in the CSE at Wilkes University combined efforts in 2012 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.

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 program administration is housed within the Department of Electrical Engineering and Physics but with supporting faculty from the Departments of Biology, Mechanical Engineering and Engineering Management, Environmental Engineering and Earth Sciences, Chemistry and Mathematics.

The programs, courses and sequences we propose in this dual-track bioengineering master’s degree are comparable to our nearest competitors in the Northeast Pennsylvania 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.

Since the inception of the program in the Fall of 2012, a few edits of the course sequences, program requirements and corrections to the original document submitted in March of 2012 are required for better instruction, operation and administration of the program. This proposal implements these changes. The suggested changes involve new sequences for both program tracks, an addition of a topics course as a required course to the Biomedical Engineering Track (BEGR 421), the status change of another course as a requirement to an elective in the Biomedical Engineering Track (BEGR 408) and the incidental changes of course renumbering due to typographical errors on the original proposal (BEGR 472 and BEGR 474). Suggestions are also made regarding which courses will be allowed as elective courses.

The newly added required course (BEGR 421) is essential, as it places our program course offering more in line with other leading Biomedical Engineering Programs and is a suggested requirement should we seek accreditation of our Bioengineering Program.
6. Other specific information. (Not applicable for incidental changes.)

The Department of Biology provides supporting faculty as well as housing part of the laboratory and research facilities for 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.
7. Program Outline.

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. Biofluidics and Microfluidics – BEGR 421 (added to sequence)
   BioMEMs – BEGR 408 (removed as requirement and
   sequence, now elective course)
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 – eg. BEGR 408, BEGR 452, Engineering Graduate Course
2. Elective – eg. BEGR 472, Engineering Graduate Course
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. Bioinformatics – BEGR 430 (moved to this sequence position)
   Biochemistry – BEGR 465 (moved from sequence position)

Second Semester
1. Molecular Biology – BEGR 424
2. Biochemistry – BEGR 465 (moved to this sequence position)
   Bioinformatics – BEGR 430 (moved from sequence position)
3. Cellular Biophysics – BEGR

Third Semester
1. Bioengineering Experimentation and Analysis – BEGR 501
2. Thesis Research (3 credits) – BEGR 599
3. Elective – eg. BEGR 474, BEGR 426, BEGR 427, BEGR 429

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.

Print Name/Title Thyagarajan Srinivasan Prof. & Interim Chair  Signature  Date  
Department chair(s) of all potentially affected programs (Dept. EE and PHY)  

Print Name/Title Jamal Ghorieshi Prof. & Interim Chair  Signature  Date  
Department chair(s) of all potentially affected programs (Dept. ME and EMGT)  

Print Name/Title Michael Steele/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 Susan Hritzak  Signature  Date  
Registrar  

Print Name Terese Wignot, Assoc. Prof., Interim Provost  Signature  Date  
Provost (For new programs, program elimination, significant program revisions and revisions to the General Education curriculum).

Provost should check here ___ if this proposal is a program revision AND the significance of the revision requires review and approval by APC prior to Curriculum Committee.
Wilkes University Curriculum Committee
COURSE ADDITION FORM – page 1

1. Course Title: Biofluidics and Microfluidics

2. Course Number: BEGR 421

3. Course Credit Hours: 3
   Classroom Hours _3___  Lab Hours _2___  Other ____

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

5. Course Description (as proposed for the Bulletin):

   Students learn how to mathematically and quantitatively describe fluid flow throughout organ systems and biomedical devices. Other topics covered include how flow correlates with diseases.
6. Required Documentation:

Proposed Syllabus:  
Suggested Syllabus
Lectures: 3 hours per week  
Laboratories: 2 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 – 25%, mid-term exam – 25%, laboratories – 25% and final exam – 25%.

Textbook:

Prerequisite: Undergraduate Degree in Engineering or Applied Physics and Acceptance into Bioengineering Program and Permission from Instructor(s)

Instructor(s): Pervez Kalim

General Overview of Course Topics:
1. Introduction
2. Review of Basic Fluid Mechanics
3. Cardiovascular, Circulatory, and Pulmonary Systems
4. Blood Rheology and Diseases
5. Models of Biofluid Flows and Drug Delivery
6. Computational Biofluid Mechanics
7. Basic Transport Phenomena in Biological System
8. Bioheat Transfer

Specific Course Topics:

A. Fluid and Solid Mechanics and Cardiovascular Physiology
   i. Fundamentals of Fluid Mechanics
   ii. Introduction to Solid Mechanics
   iii. Cardiovascular Physiology

B. Biomechanics of the Human Circulation
   i. Rheology of Blood and Blood Vessel Mechanics
   ii. Static and Steady Flow Models
   iii. Unsteady Flow and Non-uniform Geometric Models
   iv. Native Heart Valves
   v. Phenomenon of Air flow in the Lungs.

C. Cardiovascular Implants and Biomechanical Measurements
   i. Prosthetic Heart Valve Fluid Dynamics
   ii. Vascular Therapeutic Techniques
   iii. Fluid Dynamic Measurement Techniques

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7. Course Title: Cellular Biophysics

8. Course Number: BEGR 472

9. Course Credit Hours: 3
Classroom Hours 3  Lab Hours 2  Other

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

11. Course Description (as proposed for the Bulletin):

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.
12. Required Documentation:

Suggested Syllabus

BEGR 472 Cellular Biophysics

Location and Meeting Time
SLC 380, Thursday 2:20PM – 5:10 PM

Course Description
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 an advanced quantitative and physical understanding of the biological molecules that drive 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.

Course Objectives
- To become familiar with the various mathematical techniques commonly used to describe cellular processes
- To understand the link between cellular processes and the underlying physical processes that drives them
- To become familiar with the physics behind the experimental techniques and instrumentation used to probe the physical properties of biological molecules and systems
- To become familiar with the physical mechanisms behind the most important and ubiquitous cellular processes

General Information
This course is cross-listed as PHY 398 and BIO 398. This course will be team-taught by Dr. Harms, and Dr. Lucent.

Dr. Gregory Harms
Office: SLC 154
Office Phone: 570.408.4828
Email: gregory.harms@wilkes.edu
Office Hours: By appointment

Dr. Del Lucent
Office: SLC 231
Office Phone: 570.408.4834
Email: del.lucent@wilkes.edu
Office Hours: M 11:00 AM – 12:00 AM, TRF 9:00 AM – 10:00 AM
Text and Course Materials
There is no required textbook for this course. The lectures will be prepared using a number of graduate biophysics texts that you are welcome to purchase for your own library if you so choose. We will also try to have them available on reserve in the library for use in the library only.

- Molecular Driving Forces by Ken Dill, ISBN 0815344309
- Structure and Mechanism in Protein Science by Alan Fersht, ISBN 0716732688
- Random Walks in Biology by Howard C. Berg, ISBN 0691000646

This course will also make use of Mathematica for generating graphics and building mathematical models. Most campus computers have Mathematica 8 installed, and as students at Wilkes you also qualify for a free home license of Mathematica on your own computer.

Grading

Coursework Composition
Attendance – 15%
Homework – 25%
Participation – 5%
2 Exams – 30%
Final Paper/Talk – 25%

Grading Scale
4.0  90% and above
3.5  85 – 89%
3.0  80 – 84%
2.5  75 – 79%
2.0  70 – 74%
1.5  65 – 69%
1.0  60 – 64%
0.0  59% and below
Attendance and Participation
Attendance of all lectures periods is mandatory. Since this class meets only once per week, missing a single lecture constitutes missing an entire week’s worth of material. The instructors must excuse all absences for you to receive credit for attendance and to be allowed to make up any missed work. Repeated absence is cause for a failing grade in the course. Furthermore, courses such as this benefit significantly from in-class discussion. As such, class participation is also a required part, in which your instructors will attempt to have a clear participation scheme.

Homework
We will provide periodic assignments to help you further explore and understand the course material. These may take the form of problem sets, short Mathematica projects, or reading assignments from primary literature. You will typically have one to two weeks to complete an assignment. Late assignments will be penalized and assignments more than one week late will not be accepted.

Exams
There will be two exams during the course, each consisting of a combination of multiple choice questions, short answer problems, and long answer problems. The exams will not be cumulative, but general mathematical and physical principles that are common to all course material will likely be present on both exams.

Paper and Talk
You will be required to write a research paper and give a short 20-minute PowerPoint presentation at the end of the course. This paper can be about any topic in biophysics that you find interesting but also must be relevant to course material in terms of both theory and experimentation and will be subject to the approval of the instructors. You will have to submit a title and a two or three sentence description of your topic after the first third of the course, an outline after the second third, and the paper will be due a few weeks before the end of the semester.
**Tentative Course Schedule**
The following is a tentative course schedule. Since this is the second time we will be offering this course, we may spend more time on any of these topics and/or cover biophysical topics not on this list.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Exam/Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>January 16</td>
<td>Introduction, Mathematica tutorial, and calculus review</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>January 23</td>
<td>Kinetics, thermodynamics, and quantum mechanics</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>January 30</td>
<td>Nucleic acid structure and stability I, Spectroscopy</td>
<td>Homework 1 Due</td>
</tr>
<tr>
<td>4</td>
<td>February 6</td>
<td>Protein structure and stability</td>
<td>Paper topic due</td>
</tr>
<tr>
<td>5</td>
<td>February 13</td>
<td>Protein folding I</td>
<td>Homework 2 due</td>
</tr>
<tr>
<td>6</td>
<td>February 20</td>
<td><strong>Exam 1</strong></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>February 27</td>
<td>Protein folding II</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>March 6</td>
<td><strong>Spring Break</strong></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>March 13</td>
<td>Biophysics of lipids and membranes</td>
<td>Homework 3 due</td>
</tr>
<tr>
<td>10</td>
<td>March 20</td>
<td>X-ray crystallography</td>
<td>Paper outline due</td>
</tr>
<tr>
<td>11</td>
<td>March 27</td>
<td>NMR I</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>April 3</td>
<td>NMR II / Protein – ligand bind I</td>
<td>Homework 4 due</td>
</tr>
<tr>
<td>13</td>
<td>April 10</td>
<td>Protein – ligand binding II and Enzyme kinetics</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>April 17</td>
<td><strong>Easter break</strong></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>April 24</td>
<td><strong>Exam 2</strong></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>April 29</td>
<td>Student talks (<em>T follow R schedule</em>)</td>
<td>Research paper due</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td>Student talks / SRS</td>
<td></td>
</tr>
</tbody>
</table>

**A note on academic honesty**
Please make sure to practice academic integrity and avoid plagiarism. Copying and pasting are strictly prohibited on all assignments (slides, homework, paper, and field trip summary). Use of external sources in your work should be accompanied by the appropriate citation. At this stage in your careers you are expected to be able to distinguish between legitimate transfer of knowledge and plagiarism. We encourage you to review the policy on academic honesty in your student handbook, as it will be strictly enforced in this course.

**Final thoughts**
Since this is only the second time we have run this course we will be curious about your input. The goal is to illustrate the importance of physics and mathematics for a quantitative and mechanistic understanding for cellular phenomena. Hopefully we will be able to find the right blend of theory and experiment, and general phenomena and specific systems. We have organized the tentative schedule with this in mind. We will most likely make changes to the course schedule to better serve the goals of the course (or to entertain good ideas anybody may have along the way).
13. Course Title: Imaging in Biomedicine

14. Course Number: BEGR 474

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

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

17. Course Description (as proposed for the Bulletin):

   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.
18. Required Documentation:

**Proposed Syllabus**

**BEGR 474 – Imaging in Biomedicine**

Fall 2013 – Course Numbers:
Wilkes University - Division of Engineering and Physics

Course Description:

**BEGR 474. Imaging in Biomedicine—THREE CREDITS:** Biological and medicinal imaging techniques. This course will cover different aspects of imaging important to medicine and biomedicine including optical microscopy, scanning probe microscopy, scanning electron microscopy, magnetic resonance, ultrasound, X-ray, nuclear radiation, microwave and electo-/magneto-encephalographic techniques as well as image processing. 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.

This course meets for lecture three hours a week and will have a laboratory that will meet weekly. Fee: Course fee plus lab fee. Please inquire at student services. Core requisite: Two semesters of undergraduate physics and the instructors’ approval. (For Bioengineering Master’s Degree Students: Undergraduate Degree in Engineering or Science, Acceptance into Bioengineering Program, and Permission from Instructors.)

Instructor(s):

1. Gregory S. Harms, Ph.D.
   E-mail: gregory.harms@wilkes.edu
   Office: SLC 154
   Telephone: 570-408-4828

2. Abas Sabouni, Ph.D.
   E-mail: abas.sabouni@wilkes.edu
   Office: SLC 236
   Telephone: 570-408-4832

3. Amjad Nazzal, Ph.D.
   E-mail: amjad.nazzal@wilkes.edu
   Office: SLC 232
   Telephone: 570-408-3276

Course Resources:

Websites: D2L-LIVE

Textbook(s): Excerpts will be given from texts and publications as necessary for lectures. Laboratory Procedures will be distributed from the Instructors.

Course Schedule and Office Hours:

Location: Lecture(s): SLC 240 (for lectures by Dr. Harms)
SLC 238 & 131 (for lectures by Dr. Sabouni)
TBA (for lectures by Dr. Nazzal)

Laboratory: SLC 240 & TBA (Harms), SLC 131 & 238 (Sabouni) and SLC 131 (Nazzal)

Office Hours – Please e-mail the appropriate instructor. (See above listings.)
Course Objectives:

1. To provide the background and to understand the principles and applications of a few selected medical imaging techniques
   A. X-ray imaging and Radiography
   B. Ultrasound Imaging and Sonography
   C. Nuclear Imaging and Positron Emission Tomography (PET)
   D. Magnetic Resonance Imaging (MRI)
   E. Microwave Imaging
   F. Electroencephalography (EEG)
   G. Magnetoencephalography (MEG)

2. To provide the background and to understand the principles and applications of a few selected molecular biomedical imaging techniques
   A. Optical Microscopy and Optical Confocal Microscopy (LSM)
   B. Scanning Electron Microscopy (SEM)
   C. Atomic Force Microscopy (AFM)

3. To provide the background and to understand the principles and applications image processing and analysis of a few selected techniques
   A. Three dimensional reconstruction and projection techniques
   B. Imaging Convolution and Deconvolution
   C. Fast Fourier Transformations

General Information and Policies:

1. BEGR 474 is an advanced imaging course and is a required course for the Biomedical Engineering Track of the Bioengineering Master’s Degree Program. The course combines the teaching and learning elements of Lectures, Laboratories, Lecture Participation/Quizzes and a Final Exam. Some of the laboratories will be held off campus.

2. Attendance is mandatory by school regulations and will be recorded every time. Please refer to the student’s handbook for the details of the policy, including the inclement weather policy through the university website. Note that if you have five consecutive, unexcused absences of meeting times, the student’s handbook distinctly defines the resulting disciplinary actions, which will be enforced in this course.

3. BEGR 474 has extra resources available on the course D2L LIVE web portal:
   A. Some lectures (notes or diagrams) will be posted on-line either prior to or following the lecture or lab.
   B. Class relevant material will be posted on-line and on reserve in the library including quizzes laboratory procedures and practice problems for the final exam and solutions.
   C. Extra textbooks and/or reading material might also be found on the web portal or on the reserve shelf in the library.
   D. The quizzes will be given in class with a due date but might be also posted on-line.

4. The lectures contain both instructional and interactive parts with introductions of concepts and questions, problems and examples pertaining to the concepts. Students are encouraged to ask and answer questions. Interactive participation is an important part of each student’s grade.

5. Office hours are the time to discuss individual problems, graded material and personal issues. If enough issues of the same nature are brought to the instructor, he might then address them during the lecture or discussion session. Please either check the instructor’s schedule (posted on office door) for regular office hours or send an e-mail to an individual instructor to schedule an appointment with him to see him personally.

6. Each individual student in this course must abide by the rules and regulations as stated in the Student Handbook of Wilkes University.
Grading: In the Division of Engineering at Wilkes University, students earn their grades.

1. The grading in this course has the following weighting for the components: (tentative)

<table>
<thead>
<tr>
<th>Participation and Quizzes</th>
<th>Laboratory Work and Report</th>
<th>Final comprehensive exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>25%</td>
<td>50%</td>
<td>25%</td>
</tr>
</tbody>
</table>

2. The earned final grade will be assigned by the accumulated percentage during the semester and categorized according to the following scheme:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.0</td>
<td>90% and above</td>
</tr>
<tr>
<td>B+</td>
<td>3.5</td>
<td>85 to 89%</td>
</tr>
<tr>
<td>B</td>
<td>3.0</td>
<td>80 to 84%</td>
</tr>
<tr>
<td>C+</td>
<td>2.5</td>
<td>75 to 79%</td>
</tr>
<tr>
<td>C</td>
<td>2.0</td>
<td>70 to 74%</td>
</tr>
<tr>
<td>D+</td>
<td>1.5</td>
<td>65 to 69%</td>
</tr>
<tr>
<td>D</td>
<td>1.0</td>
<td>60 to 64%</td>
</tr>
<tr>
<td>F</td>
<td>0.0</td>
<td>59% and below</td>
</tr>
</tbody>
</table>

All final accumulated percentages will be rounded to the next highest integer.

3. The specific items to be graded have their own criteria:

   A. Participation and Quizzes (25%): You must attend, participate and present (at times) during the lecture sessions. Quizzes will normally be given weekly during the lecture or will be given on-line with an expected due date with the submission specified as in person or on-line.

   B. Laboratory Projects/Reports (50%): This will be discussed during lecture. A formal written framework will be given to you regarding the later in writing.

   C. Final Exam (25%): The final will be comprehensive. A study guide will be given in advance of the exam.

Course agenda:

The course material will be covered in 14 weeks in the suggested agenda below:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic(s)</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug. 26, 2013</td>
<td>Background Information</td>
<td></td>
</tr>
<tr>
<td>Sept. 3, 2013</td>
<td>Background Information –</td>
<td>Optical Microscopy</td>
</tr>
<tr>
<td>Sept. 9, 2013</td>
<td>Background Information –</td>
<td>Optical Microscopy</td>
</tr>
<tr>
<td>Sept. 16, 2013</td>
<td>Background Information –</td>
<td>Optical Microscopy</td>
</tr>
<tr>
<td>Sept. 23, 2013</td>
<td>Background Information –</td>
<td>OM Sonography</td>
</tr>
<tr>
<td>Sept. 30, 2013</td>
<td>Optical Imaging, Radiography</td>
<td>OM Sonography</td>
</tr>
<tr>
<td>Oct. 7, 2013</td>
<td>Optical Imaging</td>
<td>OM Sonography</td>
</tr>
<tr>
<td>Oct. 14, 2013</td>
<td>Optical Imaging, Sonography</td>
<td>Radiography</td>
</tr>
<tr>
<td>Oct. 21, 2013</td>
<td>Sonography, Radiology</td>
<td>Radiography</td>
</tr>
<tr>
<td>Oct. 28, 2013</td>
<td>Sonography, Radiology</td>
<td>Radiography</td>
</tr>
<tr>
<td>Nov. 4, 2013</td>
<td>EEG, MEG, FFT, Deconvolution</td>
<td>EEG, MEG, FFT, Deconvolution</td>
</tr>
<tr>
<td>Nov. 11, 2013</td>
<td>MRI</td>
<td>MRI</td>
</tr>
<tr>
<td>Nov. 18, 2013</td>
<td>Microwave</td>
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<tr>
<td>Nov. 25, 2013</td>
<td>SEM, AFM</td>
<td>SEM, AFM</td>
</tr>
<tr>
<td>Dec. 2, 2013</td>
<td>SEM, AFM</td>
<td>SEM, AFM</td>
</tr>
<tr>
<td>Dec. 9, 2013</td>
<td>SEM, AFM</td>
<td>SEM, AFM</td>
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