Student – Faculty/Manager Mentor Contract: BIOEN 4990 (BIOEN Research/Internship)

**Student**

- **Duties**
  - Minimum of 200 actively engaged project hours
    - Hours don’t include training time and are often spread over multiple semesters
    - 80 hours minimum for 1 credit of BIOEN 4990 (may be repeated)
    - Approximately 6 hours/week (minimum)
  - Be integrated into a research/design group
    - Make weekly contact with faculty advisor/manager (or representative)
    - Participate in lab/company culture including attending group meetings
    - Become trained to perform experiments, simulations, device testing, or related tasks
  - Conduct literature review for project
    - Read key papers related to research project under guidance of research advisor/manager
  - Be actively engaged in the research or design activity for the thesis project
    - Actively participate in experimental/engineering design
    - Conduct experiments, simulations, tests and/or designs
    - Apply statistics to experimentation
  - Generate results for papers, posters, and presentations to be used in BIOEN 4201/4202
    - Papers, posters, and presentations will be single author documents in BIOEN 4201/4202
    - Students must not plagiarize, including other lab documents
  - Material submitted for a grade in BIOEN 4201/4202 must be the student’s work product and accurately reflect the student’s ability (i.e. mentor/manager will not write or edit the thesis)
  - Create a project abstract that is approved by PI/Manager
    - Submit an abstract describing the project when submitting the contract (250 words max)
    - Submit a 3-5 page research report to the Thesis course Primary Instructor (Heather Palmer) prior to enrolling in BIOEN 4201 (Thesis I). See assignment sheet for report requirements.

- **Expectations/Deliverables**
  - Collect data for and complete thesis project prior to taking BIOEN 4201
    - Minimum of 200 total research/project hours
    - Typically done over several semesters but can be done in one
  - Successful completion of BIOEN 4990 (C grade or better) allows enrollment in BIOEN 4201
  - Volunteer position unless UROP or other funding is obtained
    - Submit an abstract describing the project when submitting the contract (250 words max)
    - Submit a 3-5 page research report to the Thesis course Instructor/Coordinator prior to enrolling in BIOEN 4201

  I, the undersigned, hereby acknowledge that I have read and understand the advisor/manager expectations as well as the student expectations and will comply with them to the best of my ability. I also understand and verify that the project represented in the abstract is the student’s thesis project that will be used for and presented in BIOEN 4201/4202.

**Faculty Advisor/Manager**

- **Duties**
  - Act as a mentor for the student
    - Direct in development of a clearly defined thesis project
    - Meet regularly with student
    - Provide direct, regular feedback of student’s performance
    - Facilitate lab participation (e.g., be considerate of student’s class schedule)
  - Provide instruction on bibliography generation
    - Provide three papers to start literature research
    - Instruct student on literature search methodologies
  - Provide instruction on lab methodologies
    - Involve student in experimental or engineering design of project
    - Instruct on lab safety and appropriate methodologies for project
    - Introduce appropriate statistical treatment of data and post-hoc analysis
  - Provide limited review of project-relevant papers, posters, and presentations
    - Papers, posters, and presentations will be single author documents in BIOEN 4201/4202
    - Remind students not to plagiarize lab documents
    - Material submitted to BIOEN 4201/4202 must be the student’s work product and accurately reflect the student’s ability (i.e. mentor/manager will not write or edit the thesis)
  - Identify intellectual property concerns and develop an appropriate disclosure strategy
    - Student will present work in April of the year taking BIOEN 4202
    - The senior symposium in April is considered a public disclosure by USPTO standards

- **Expectations**
  - Student will contribute at least 80 hours per credit of BIOEN 4990
  - Student will contribute at least 200 hours toward completing thesis project
  - Student will enhance lab/company community
  - Student has no expectation to be paid for research hours (except in an internship setting in industry) but advisor is not restricted from paying the student
BIOEN 4990, Bioengineering Research or Internship Abstract Assignment

Purpose/Background:

An abstract is an excellent tool to convey in writing the key points of your research. It can be a very difficult document to write as every word must be carefully selected to convey the maximum amount of exclusively relevant information in a limited amount of words.

Assignment:

1. Because the abstract is a synopsis of your entire thesis project, it includes elements of your introduction/background, methods, results, and discussion of those results. It is important to include your hypothesis/method aim/design aim.

2. The length of abstract cannot exceed 250 words.

3. The abstract content must represent your actual thesis project.

4. The abstract content must be approved by your research professor/manager prior to being submitted to the course instructor. Planning an appropriate amount of time to receive abstract approval is essential to timely enrollment in BIOEN 4990. Revisions may be necessary prior to approval.

5. The abstract must be submitted in conjunction with research/internship project contract to the course instructor. The abstract will be used to determine your eligibility to enroll in BIOEN 4990. Similar to receiving approval from your research professor/manager, planning an appropriate amount of time to receive abstract approval from Heather Palmer is essential to timely enrollment in BIOEN 4990. Abstracts and contracts will not be accepted separately. Furthermore, abstracts and contracts will not be accepted later than 1 week prior to the beginning of the semester.
BIOEN 4990 Research Report Assignment

Purpose: Eligibility for BIOEN 4201 (Thesis Writing and Communication I) is based on the content of this report. As you are aware, you need to meet two minimum requirements: 1-at least 200 hours of research on one project (this can be done in as part of an internship) and 2-a completed research project. The research project may be done in conjunction with a graduate student, but you will EXCLUSIVELY focus on your personal contribution to the research. This paper is SINGLE AUTHOR (i.e. you).

Your eligibility will be determined by the results you include in this report. Please provide relevant tables, charts, and figures to demonstrate your findings.

Your audience for this report is a general, academic biomedical engineering reader. Your audience dictates much about the writerly choices you make.

This report is due by the last day of classes in the semester (the date is listed in the syllabus). Please use Microsoft Word, not pdf.

Please cover these 7 aspects as thoroughly as possible in 3-5 pages (1.5 or double spaced). Note that the page limit does not include figures, charts, and tables (these can take as many pages as necessary beyond the 3-5):

1. Title and author: Use a title that balances the general area of the research with your specific contribution. A reader will decide whether or not to continue with a scientific article based on the title, so choice of words and phrasing is part of the effectiveness of the paper—be careful to make the title accessible and not unwieldy. Finally, this is a single-author paper, so only your name will appear in this area.

2. Introduction: Appropriately cover the global context as well as the project’s context. Be sure to include your hypothesis, design aim, or method aim. Any work that is not your own that is included here should be cited.

3. Methods: Include the materials used, describe the experimental method and the rationale behind why this method was used, and describe any data processing used (including statistical analysis). You may organize the methods according to subheadings. Provide sufficient detail to demonstrate that you followed a robust methodological approach.

4. Results: Include the relevant results derived from your methods. You need sufficient detail to allow your reader to fully understand your findings, but DO NOT interpret. You may organize the results section according to the relevant subheadings found in methods, but it isn’t required. You need sufficient detail to allow your reader to fully understand your findings. Also, include appropriate tables with useful titles and figures with useful captions, and relevant statistics.

5. In-text References: Cite any information pulled from primary literature according to IEEE Transactions on Biomedical Engineering.

6. Reference Section: Include 5-7 references. Cite in the text where applicable (this is most likely to come up in the background). Format according to IEEE Transactions on Biomedical Engineering.

The report format is submission style (i.e. single-column, 1.5 or double spaced, 10 or 12 pt., any professional font). However, provide your charts, tables and figures as near as possible to the text where you describe them. Also include a title and page numbers.

7. Timeline: If you are finished with your project, please simply indicate that you are done. If the results are preliminary, provide a detailed timeline (dates) of when you will have your results. The results must be collected, analyzed, and ready to report by October. The timeline will greatly determine whether or not you will be allowed to take BIOEN 4201.

Please refer to the grading rubric for more details on content areas.
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<thead>
<tr>
<th>BIOEN 4990 Report Rubric</th>
<th>Comments</th>
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<tr>
<td><strong>Background:</strong></td>
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<tr>
<td>Global Context, Project Context, Research/Design/Method Statement, Strategy and Accomplishments</td>
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<td><strong>Methods:</strong></td>
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<td>Description of Materials, Experimental methods with rationale, and data processing, including statistics</td>
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<td><strong>Results:</strong></td>
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<td>Detailed description of findings or prospective findings from methodological approaches (qualitatively and quantitatively)</td>
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<td>Include data analysis and statistics (if available)</td>
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<td><strong>Timeline:</strong></td>
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<td>If results are preliminary, provide a timeline of major milestones</td>
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<td><strong>Structure and Organization</strong></td>
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<td>Logically ordered ideas, Flow, Transitions, Appropriate sign-posting and over-viewing (between sections), Clearly identifiable topic sentences, Balance</td>
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<td><strong>Supporting Material/References:</strong></td>
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<td>5-7 relevant references</td>
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<td>Consistent citation format</td>
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<td><strong>Overall written presentation quality:</strong></td>
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<td>Effectively communication to the intended audience (discourse community)</td>
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<td>Balance between concision and detail</td>
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<td>Definition of terms/abbreviations/symbols</td>
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