Undergraduate Research for Credit
Joint Department of Biomedical Engineering

This form must be completed for either BME 295 / BMME 295 or BME 498 / BMME 495. Please read these important points carefully before completing the application. When complete (including signatures), email as a Word doc or PDF to BME Student Services at bme_student_services@ncsu.edu or bme_student_services@unc.edu. Name the document by this convention: Last_First_course number_Form.

- Students must identify an appropriate BME faculty mentor themselves; one will not be assigned. Tips on finding a faculty mentor here: https://bme.unc.edu/wp-content/uploads/sites/917/2021/08/Undergrad-Research-Guide-1.pdf

- Visit the link below for detailed descriptions of the various course numbers: https://bme.unc.edu/undergraduate/research-for-undergraduates/

- If a BME student selects a research advisor who is not a BME faculty member, they must find a BME faculty member who can serve as the Instructor of Record. This IOR will not be provided, but if you are having trouble please ask your research advisor or the Director of Undergraduate Research. The IOR will assign the grade in consultation with the research advisor.

- Please adhere to the following deadlines, as it will typically take ~3 weeks for review by the BME Undergraduate Research Committee. Revisions may be needed, and final approval must be obtained before the first day of classes. The Student Services Coordinator of the home campus will perform enrollment after final approval.

Spring (for summer or fall enrollment*)	First Monday in April
Summer (for fall enrollment*)	Second Monday in July
Fall (for spring enrollment)	Third Monday in October

* Students who need to know if their application for fall enrollment is approved for planning purposes should choose the Spring deadline. Otherwise, there is no difference in the Spring and Summer deadlines.

APPLICANT INFORMATION (to be completed by the student):

Student Applicant's Name:
PID/Student ID:
E-mail: Phone #:
Date of Application:
Major:
Class: ☐First Year ☐Sophomore ☐Junior ☐Senior ☐Other (explain)
Course Number – Please check: ☐BME 498 3 Cr. ☐BMME 495 3 Cr.
☐BME 295 1-3 Cr. ☐BMME 295 1-3 Cr.
☐Other (Explain)
Credit Hours (295 only, select 1-3): ☐ 1; ☐ 2; ☐ 3;
Semester Requested: ☐Fall ☐Spring YEAR:
Current GPA (Cumulative):
Please check all that apply: ☐Graded
☐S/U (cannot be applied toward the BME degree or minor requirements)
☐Tissue Engineering Minor
Are you being paid for this research? ☐ YES ☐ NO

Descriptive Title of Research Project

RESEARCH ADVISOR:
Name: Department Home Institution
E-mail: Phone number
Note: An alternate Instructor of Record must be assigned if the research advisor is not a primary faculty member of the Joint BME Department.

INSTRUCTOR OF RECORD (IOR), if different from Research Advisor:
Note 1: The Instructor of Record must be a member of the Joint BME Department and is responsible for assigning the grade in collaboration with the research advisor. The IOR must submit the grading rubric and final written report to BME student services.
Note 2: Faculty members cannot serve as IOR for more than two students per semester. Mentorship of senior honors theses do not count against this limit.

Name: Department Home Institution
E-mail: Phone number

COURSE REQUIREMENTS (to be completed by the Research Advisor). This is considered a contract between the research advisor and the student. Deviations from this contract should be updated and documented to the extent possible by the research advisor and student. Students are expected to devote at least three hours of independent work per week for each unit of credit (e.g., 9 hours per week if 3 credit hours).

a. Meeting requirements with the research advisor (e.g., individual meetings, lab meetings, etc.). Include day/time of weekly or bi-weekly meetings:

b. Reading assignments (and due dates, if relevant):

c. Written assignment (required). If following these guidelines, write "confirmed". 6-10 pages at 1.5 line spacing, 1 inch margins, Arial 11. Can exceed page limit to account for large figures and references. Include Introduction, Methods, Results (with data in the form of figures/tables), Discussion, References. If not following these guidelines, clarify the expectations for the final report. After the report is completed and graded, the Instructor of Record should email it to bme_student_services@ncsu.edu or bme_student_services@unc.edu as a final record.:

d. Oral presentation (required). State which of the approved venues will be used for presentation:

Fall semester: Oral presentation at BME Graduate Seminar (Coulter Seminar Series) on the last Friday before the start of reading days / finals.
Spring semester: Poster presentation at the UNC Celebration of Undergraduate Research or NC State OUR Undergraduate Research Symposium
Either semester: An appropriate regional or national conference, or Other (please specify).
Note: If intellectual property considerations prevent a public presentation, a "lab meeting" format for internal presentation is allowed. Please note if this is the case:

e. **Grading.** If following the rubric at the end of this form, write "confirmed". If different criteria or percentages will be used, explain the criteria here:

f. Other information:

PROGRAM OUTCOMES

For the Program Outcomes below, specifically describe how the research project will address the outcome. Do not cut and paste from the proposal.

o All seven of the outcomes must be addressed for both 295 and 498 / 495 proposals
o For 295, at least three of outcomes 1, 2, 3, 6, and 7 must be checked as substantial. You still need to address the others, but can be marked as "no" for substantial.
o For 495 / 498, at least four of outcomes 1, 2, 3, 6, and 7 must be checked as substantial. You still need to address the others, but can be marked as "no" for substantial.
o Text fields will expand indefinitely and at least 2-3 sentences are expected for outcomes that are marked as "substantial".

1: *An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.*
Substantial? ☐ Yes ☐ No
>Describe the problem to be addressed, and the general relevant principles. List the courses (numbers) that taught the original scientific and engineering concepts, e.g. MAE 214, BME 210, BME 342, BMME 160, BMME 350, etc. For senior level electives, this independent study/research project should draw upon knowledge learned in junior level courses.

2: *An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.*
Substantial? ☐ Yes ☐ No
>Briefly describe the engineering design component(s) of the project, for example, a tool or device that will be designed, an analytical model that will be developed, or a process that will be created. Describe how the solution considers listed factors.

3: *An ability to communicate effectively with a range of audiences.*
Substantial? ☐ Yes ☐ No
>Describe any written reports or other materials, poster presentations or oral presentations required. For required oral presentations, list at least one potential venue for the presentation (note – this is not a commitment to a specific venue; the venue may be changed).

4: *An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.*
Substantial? ☐ Yes ☐ No *Note: this cannot count towards the 3/4 required substantial
>Describe the ethical implications of the project and professional responsibilities from an engineering standpoint, including the potential scope of the project's impact.

5: *An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.*
Substantial? ☐ Yes ☐ No *Note: this cannot count towards the 3/4 required substantial

>Describe the team environment for this project, including the student's role, and the roles of others associated with the project and/or the research group. How are the components of this outcome met?

6: *An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.*
Substantial? ☐ Yes ☐ No
>Describe the student's role in developing the experimental approach and the protocols, and in the analysis and interpretation of data. Where is engineering judgement applied?

7: *An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.*
Substantial? ☐ Yes ☐ No
>Describe what new knowledge, including skills, the student will need, and how it/they will be acquired.

PROPOSAL INSTRUCTIONS: Attach a detailed description of the planned project, approximately 1000 words (2 pages single spaced) not including references and figures. This proposal must be written by the student and should not contain material taken directly from grant proposals, research program descriptions or posters/publications from the research advisor's group. If the project is part of a larger and/or ongoing research program, the proposal should clearly indicate what will be done by the student. Use of the first person is encouraged. Suggested format is that of a research proposal including introduction, methods, specific aims and research plans. The proposal should be comprehensible to individuals outside the specific area of research, for example, adequate background should be provided, acronyms should be spelled out and technical terms should be explained. Include a bibliography in standard format, citing all appropriate references. Submit the proposal as a separate Word of PDF document with a title "Last_First_course number_Proposal." Email it to bme_student_services@ncsu.edu or bme_student_services@unc.edu along with the completed application form.

Student, Faculty and Administrative signatures

RESEARCH ADVISOR, INSTRUCTOR OF RECORD AND STUDENT RESPONSIBILITIES:
Your typed name below indicates that you have read the requirements expected from you as a student/instructor, agree to undertake these responsibilities, and will abide by the relevant Honor Code. It is not necessary to obtain a written/digital signature. Your typed name in the appropriate box is sufficient Students may only type the name of the research advisor/instructor of record if they have received explicit permission to do so.

Research Advisor_____ Date _____

Instructor of Record, if
different from Research Advisor _____ Date _____

I have read the requirements expected of the student, agree to undertake these responsibilities, and will abide by the Honor Code's responsibilities of students.

Student _____ Date _____

***INDEPENDENT STUDY COORDINATOR**
This application for Independent Study has been reviewed. The proposal is

- ☐ APPROVED AS IS
- ☐ REQUIRES MORE INFORMATION (provide details and return to instructor and student)
- ☐ NOT APPROVED (provide rationale)

_____ _____
School/Department/Program Independent Study Coordinator Date

***** If the Independent Study Coordinator is not the Department/Curriculum Chair, the Director of Undergraduate Studies (DUS), or another Faculty Designee of the Chair, then the Chair or the DUS must also approve this contract.

**** CHAIR OR DIRECTOR OF UNDERGRADUATE STUDIES (whichever is applicable):**

This application for Independent Study has been reviewed. The proposal is

- ☐ APPROVED AS IS
- ☐ REQUIRES MORE INFORMATION (provide details and return to instructor and student)
- ☐ NOT APPROVED (provide rationale)

_____ _____
Chair/Director of Undergraduate Studies/Faculty Designee/SAD Date

****** If the Chair is the student's independent study instructor, this form must be signed by the Chair's Senior Associate Dean (SAD).

Note: Departments/Curricula must maintain copies of this contract for a minimum of two years

Independent Study or Research for Academic Credit grading rubric (submit to Undergraduate Office upon project completion)

	poor or incomplete (below 65 pts)	*moderate or developing (65 -74 pts)*	*competent and nearly complete (75 - 84 pts)*	*accomplished (85 -94 pts.)*	*exemplary (95-100 pts.)*
Development of Research Plan (15%)	Incomplete understanding of the problem, research strategy, and limitations when assisted by the instructor	Understands the problem, the research strategy, and the limitations of the approach when assisted by the instructor, but requires a high level of supervision	Able to understand the problem, the research strategy, and the limitations or the strategy when explained by the instructor	Able to understand the problem, devise a research strategy that can be implemented with limited assistance, and consider limitations of the research method	Able to understand the problem, devise research approach independently or suggest a novel approach, and demonstrate a solid understanding of the limitations of the proposed research method
Execution of Research Plan (25%)	Does not complete the research protocol, is unreliable, and is not competent with the research techniques	Completes a small component of the research protocol and demonstrates proficiency in some of the research methods and techniques	Completes the majority of the research protocol and demonstrates proficiency with the majority of the research methods and techniques	Completes the research protocol and demonstrates proficiency with the research methods and techniques	Completes the research protocol and demonstrates a high skill level with all of the research methods and techniques
Data Analysis (30%)	Does not complete the data analysis or demonstrates incompetence in the data analysis methods	Completes some, but not all, of the data analysis or needs frequent correction	Nearly completes the data analysis or requires some minor correction	Completes the data analysis without need for correction	Completes the data analysis without correction and is able to independently understand and analyze the significance of the data
Written Report (15%)	Does not complete the written report, incorrectly reports the results, is unable to write an abstract, poor construction of tables and figures	Misses some major features of the results, or tables; figures and text need significant editing	Completes the major points in the abstract, introduction, methods, results, conclusions, and references; completes figures and tables; but some editing and corrections remain	Completes the major points in the abstract, introduction, methods, results, conclusions, and references; completes figures and tables.	Manuscript is complete and well-written. Figures and tables are complete and well-designed. All important conclusions of the research are accurately reported in the manuscript.
Oral Presentation (15%)	Unable to communicate and articulate the methods and conclusions in a way that others can understand; Grammar is poor	Arguments are unclear and poorly structured. Does not present the material at a level appropriate for the audience. Some grammatical errors.	Arguments are sometimes unclear. Some material is not presented at a level appropriate for the audience.	Arguments are clear. Presentation follows a logical order. Material is presented at the appropriate level.	Presentation is well articulated. Findings are presented in an appropriate style and format. Grammar is excellent. Uses media effectively.

	Points = % x pts.
Development of Research Plan (15%)	
Execution of Research Plan (25%)	
Data Analysis (30%)	
Written Report (15%)	
Oral Presentation (15%)	
TOTAL POINTS	

Range	Grade
92 - 100	A
90-<92	A-
88-<90	B+
82-<88	B
80-<82	B-
78-<80	C+
72-<78	C
70-<72	C-
68-<70	D+
62-<66	D
60-<62	D-
<60	F