

1 credit

Bulletin Description: This is the first course of the capstone experience in physics. It results in the proposal of an undergraduate research project that is carried out in the second capstone course.

Prerequisites: Consent of instructor.

Instructor: Andrei Kryjevski, South Engineering 318D, andrei.kryjevski@ndsu.edu,
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Office hours: By arrangement

Course objectives: Synthesize and apply conceptual understanding and practical knowledge gained from coursework in order to produce a proposal for a semester-long undergraduate research project in physics. The proposed project must be feasible to be carried out by an undergraduate student. Physics majors are to complete Senior Project I and Senior Project II in their final year. Senior Project I precedes Senior Project II. In exceptional cases, which must be approved by the Capstone Committee, both courses can be taken simultaneously. Senior Project I requires students to identify a project and develop a proposal that is feasible to be carried out in Senior Project II, submit the proposal and obtain approval of the project from the Capstone Committee.

Project: The project should define and discuss a research problem or question related to a physical system or phenomenon of general interest, whose resolution would advance fundamental knowledge and have practical importance. The project must provide a broad context for understanding the nature and importance of the problem or question. When designing the project one should use the following guidelines.

The project is to achieve the following:

- (1) define a problem of general interest related to a physical system or phenomenon;*
- (2) review the current state of knowledge in the field and identify unresolved scientific issues;*
- (3) state realistic objectives and longer-term goals for the project;*
- (4) review background physics necessary to understand and address the objectives;*
- (5) describe in detail specific methods and explain why they are appropriate;*
- (6) discuss the broader significance of the work for the research field and for society.*

Students who are engaged in original research may use it as a basis for their project. In such cases, however, the project cannot be merely a presentation of their research. The project should include the broader scientific context of the research and must follow the same guidelines as above.

Finding a supervisor: A supervisor must be a tenured or tenure-track faculty member in the NDSU Department of Physics. *Exceptions require approval by the capstone committee.* In some cases students will have discussed research interests and potential projects with faculty members well before their Senior year. If this is not the case, students are expected to set up multiple meetings with several potential faculty supervisors and engage in detailed discussions before a project is chosen.

Required student resources: To be determined by the student's supervisor.

Course Schedule: There are no formal class meetings, except for the organizational meetings in the first two weeks of the semester. But the students are required to meet with the Capstone Committee every two weeks to report progress. No later than the *October 25, 2019* students must submit to the Capstone Committee a proposal (2-3 pages total), including (1) the name of the faculty supervisor, (2) a tentative title, and (3) a project description, including motivation, objectives, methods, and a plan/timeline. All proposals will undergo review, resulting in approval or revision requests. Also, students will prepare and present a 10 minute oral presentation of the proposal to the committee, which all students must attend. This presentation and project approval by the Capstone Committee prior to the end of the semester is required for a passing grade.

Students who receive approval prior to the semester end are strongly encouraged to start working on their research project.

Evaluation/Grading: Grading decisions are made by the Capstone Committee. Grading is pass/fail. An oral presentation and a proposal approval by the Capstone Committee are required for a passing grade.

Attendance Statement: According to NDSU Policy 333 (www.ndsu.edu/fileadmin/policy/333.pdf), attendance in classes is expected.

Additional Statements: *1. Veterans and student service members with special circumstances or who are activated are encouraged to notify the instructor as soon as possible and are encouraged to provide Activation Orders. 2. Any students with disabilities or other special needs, who need special accommodations in this course are invited to share these concerns or requests with the instructor and contact the Disability Services Office as soon as possible (ndsu.edu/disabilityservices). 3. The academic community is operated on the basis of honesty, integrity, and fair play. NDSU Policy 335: Code of Academic Responsibility and Conduct applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the Office of Registration and Records. Informational resources about academic honesty for students and instructional staff members can be found at www.ndsu.edu/academichonesty.*