**Requirement 5A and 5B Capstone**

**Civil Engineering Project: CEN 491**

* **3 of 4 credits apply to US 5A**
* **1 of 4 credits apply to US 5B**

**Course Overview: Catalog Description**

Final design experience requiring practitioner involvement, student reports, and oral presentations. An interdisciplinary, team approach is emphasized. Graded IP in fall.

**University Studies Learning Outcomes:**

***5A. Capstone Study***

*Approved courses will give students the opportunity to integrate their learning and produce an original expression of knowledge or understanding. Students will also demonstrate mastery of both written and oral communication.*

*Upon completion of the capstone study, students will be able to:*

*1. Synthesize the knowledge and skills gained within major courses, independently complete a research-based project or creative work and integrate the results of both in an open-ended project or experience (projects within the major are encouraged).*

Satisfied through course assignment g

*2. Integrate knowledge and principles from the field of study with those of the broader University Studies curriculum.*

Satisfied through course assignment a and b

*3. Demonstrate advanced information literacy skills by selecting, evaluating, integrating and documenting information gathered from multiple sources into discipline-specific writing.*

Satisfied through course assignments b and g

*4. Communicate effectively, both orally and in writing, the results of the project or experience.*

Satisfied through course assignments e and g

***5B. Learning Through Engagement***

*Through engagement, students deepen their understanding and appreciation of their academic study, while also reflecting on the connections between their learning and the broader communities of which they are a part. These communities may be professional, scholarly, social, cultural, economic or political. These activities provide an opportunity for students to better understand their roles as members of these communities. Service learning courses, internships, study abroad programs, independent research or creative work and experiential learning courses or practica that foster engagement and reflection may be used to meet this requirement. Capstone courses may also qualify.*

*Upon completion of this requirement, students will be able to:*

1. *Identify the needs and resources of the communities to which they belong.*

Satisfied through course assignments a, b and g

1. *Apply knowledge and skills gained through academic study to real problems and/or opportunities within their communities.*

Satisfied through course assignment b and g

1. *Describe the connections between learning on campus and the issues and needs of broader academic, professional or civic communities.*

Satisfied through course assignments e, f and g

1. *Articulate the value of engagement to other members of their communities.*

Satisfied through course assignments e, f and g

**Course Overview: Detailed Description**

CEN 491 (CEN Project) is a year-long course taken in the senior year in which student teams are presented with a life-like project and develop designs to meet the project objectives. Student teams prepare a written report and present it to an audience which includes class mates, faculty, and members of the Industrial Advisory Board (IAB). Mr. Steven Gioiosa is the instructor for this course. He is president of Sitec Engineering Company in Dartmouth, a local consulting firm. He selects the site and topic of the project, and works with the student teams as they develop their design solutions. The projects include objectives in more than one discipline. The site of the project is different every year. The students can arrive at different land uses and configurations of buildings, parking lot, and utilities. Student designs are required to satisfy regulations and codes such as planning, development, and environment. Student projects typically have included site development designs for run-off control, traffic impacts, parking, domestic water, waste water, retaining walls, and structural elements.

**Examples of Texts and/or Assigned Readings:** Selected handouts and reference materials, as provided by the instructor.

**Example Assignments and Requirements:**

1. Sit in on a town meeting (planning, conservation, or zoning); write a 1-2 page report detailing the meeting. This requirement is designed to expose the students to an integration of the technical aspects of their project to the policy and regulatory requirements in an interdisciplinary manner, and students must consider the meeting in a larger interdisciplinary context that connects to broader University Studies learning objectives as part of their report. The students may take different approaches to accomplish this, and may consider, for example, the larger political and socio-economic forces that shape local regulations and by laws, the background and motivation for permitting regulations, or the larger political issues and actions surrounding the topics discussed at the meeting.

Satisfies US 5.A.2

Satisfies US 5.B.1

1. Write a 1-2 page report discussing the permitting that is required for building on the selected site (this doubles as the formal proposal for the groups as well). This requirement is intended to reinforce the importance of utilizing technical expertise gained through the CEN curriculum in a broader context of societal needs and challenges. As above, in assignment (a), a broad perspective is required of the student, and their report should consider some interdisciplinary context that ties the issues at hand back to other University Studies coursework.

Satisfies US 5.A.2 and 5.A.3

Satisfies US 5.B.1 and 5.B.2

1. Construct a contour plot of a site

1. Informal progress reports, approximately every other week

1. Proposal (as part of the permitting report) due in mid- to late-October. As part of the proposal/permitting report, it is necessary for the students to incorporate aspects of the proposed project on the community, including economic, environmental, and/or cultural impacts.

Satisfies US 5.A.4

Satisfies US 5.B.3 and 5.B.4

1. Mid-year status report (presentations on the Fall semester study day/advisory board meeting). As part of the mid-year status report, it is necessary for the students to incorporate aspects of the proposed project on the community, including economic, environmental, and/or cultural impacts.

Satisfies US 5.B.3 and 5.B.4

1. Final report and oral presentation (Spring study day/advisory board meeting). The final report represents the culmination of four years of engineering training, and serves to bring the technical aspects of their education to bear in a larger scale holistic understanding of how the technical components of the engineering design integrate with the local community and environment. The final report includes detailed technical specifications for the design as well as a detailed description of the integration of that design with local constraints (be they environmental, economic and/or cultural). Towards that end, it is essential for the project team to utilize local community, state, and federal sources and resources to inform the development of the project. An integral part of the final report is for the students to incorporate aspects of the proposed project on the community, including economic, environmental, and/or cultural impacts. In addition, the students must reflect explicitly on the value of the engagement experience represented by the design project as a whole.

Satisfies US 5.A.1, 5.A.3 and 5.A.4

Satisfies US 5.B.3 and 5.B.4

**Sample Course Outline: Fall Semester**

|  |  |  |  |
| --- | --- | --- | --- |
| Week | Topics Covered | Other Assignment | |
| 1 | Introduction, group formation | Formation of groups. |
| 2 |  |  |
| 3 | Regulations, basic property information | Sit in on a town meeting (planning, conservation, or zoning). Write a 1-2 page report detailing the meeting. |
| 4 | Topography, overview of surveying |  |
| 5 | Topography (cont.) | Construct a contour plot of a site |
| 6 | Contracts, bidding processes, cost analysis, project timelines |  |
| 7 | Expectations for the proposal and midterm presentation | Write a 1-2 page report discussing the permitting that is required for building on the selected site (this doubles as the formal proposal for the groups as well) |
| 8 |  | Informal progress report |
| 9 |  |  |
| 10 |  | Informal progress report |
| 11 |  | Proposal Due (includes the permitting report) |
| 12 |  |  |
| 13 |  | Informal progress report |
| 14 |  | Mid-year status report (oral)/Brief IAB presentations |

**Sample Course Outline: Spring Semester**

|  |  |  |
| --- | --- | --- |
| Week | Topics Covered | Other Assignments |
| 1 |  |  |
| 2 |  |  |
| 3 | Drainage: gutter sizing, runoff analysis | Informal progress report |
| 4 | Drainage: pipe sizing, catch basin design, inlet control |  |
| 5 | TR55 and HydroCAD overview | Informal progress report |
| 6 | Septic design: permitting, setoff distances, test pits, percolation tests |  |
| 7 | Septic design: Title V regulations and design of tank, distribution box, and leech field. | Informal progress report |
| 8 | Expectations for the final report and presentation |  |
| Spring break | | |
| 9 |  | Informal progress report |
| 10 |  |  |
| 11 |  | Informal progress report |
| 12 |  |  |
| 13 |  | Informal progress report |
| 14 | Final Report and PowerPoint presentation to IAB | |