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| NAU_PrimH_dep1 | | College of Engineering, Forestry, and Natural Sciences  **EGR 486C – Engineering Design II**  Syllabus – Spring/Fall 2016 |
| **Catalog Description** | EGR 476C - Engineering Design II (3 units). Team design projects culminating with oral and written reports. Letter grade only. Course fee required. | |
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| **Prerequisites** | EGR 386w with a grade of a “C” or better, or CS 386 and ENG 302W, and instructor consent. Students must have all pre-requisites as required for their discipline-specific capstone course. | |
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| **Section Information** | |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Course #** | **Section #** | **Days & Times** | **Room** | **Instructor** | | **EGR 476C** |  |  |  |  | | |
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| **Instructor Information** | Name:\_\_\_\_\_\_\_\_\_\_\_\_\_, Position\_\_\_\_\_\_\_\_\_\_\_, Design4Practice  Office: Room\_\_\_\_\_\_\_\_; email \_\_\_\_\_\_\_\_\_\_\_\_; Office Hours: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |
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| **Course Purpose (Liberal Studies Requirements)** | **Culminating Experience within Engineering Major**  The Design4Practice Engineering Capstone is a Liberal Studies course that unites students from mechanical, environmental, civil, and/or electrical engineering majors to form multidisciplinary teams. These teams work with clients/stakeholders to research, design, and/or build a wide range of products. Students apply the tools learned throughout their engineering academic career during a two-semester capstone program. In the first semester, students identify client/stakeholder needs and plan for the implementation phase. During the second semester, students build and prototype designs or conduct research.  **Liberal Studies Essential Skills**  All EGR 476C and 486C capstone projects use **critical thinking**, **effective writing,** **effective oral communication**, and **quantitative reasoning** during both semesters. Students use critical thinking and quantitative reasoning to assess need and develop solutions for their clients/stakeholders. This requires critical thinking on the student’s part because the student must break down a client’s perceived problem and use engineering management, design, and calculation tools to solve they client’s problem. All projects require multiple written reports, ranging from preliminary design proposals and research plans to final design reports and research papers. Designs require quantitative reasoning using skills acquired during the students careering in engineering and through required Liberal Studies courses. In addition, students orally present work multiple times throughout both semesters, including at UGRADs.  **Distribution Block**  The EGR Capstone addresses the Liberal Studies Science and Applied Science Distribution Block. While engineering capstone projects incorporate a range of liberal study distribution blocks, all projects **apply science and engineering knowledge and skills** to solve or research a specific problem. Specifically, the EGR Capstone addresses the application of scientific knowledge and technologies to solve a specific problem. | |
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| **Course Structure** | This course is a multidisciplinary capstone experience. Students form Multidisciplinary teams depending on the nature of the projects. Instructors present content in lecture and workshop formats. Lectures will guide teams through writing a proposal for the EGR 486C Capstone project. In addition to lectures, instructors meet regularly with each team to review progress and make plans for upcoming deadlines. | |
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| **Course Learning Outcomes** | 1. Execute the design process considering realistic constraints such as societal, technical, economic, and environmental impacts. *(ABET (c) (LS – quantitative reasoning and critical thinking) (Science and Applied Science Distribution Block – Applies scientific knowledge and technologies to solve a problem.* 2. Work effectively with other majors as a team of diverse individuals *(ABET (d)* 3. Communicate effectively in teams and in presentations (g), and develop technical writing skills that allow them to communicate effectively in writing (ABET (g) (LS - effective writing and communication)    1. Pursue individual learning and the resources necessary to complete a project. (ABET (i) | |
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| **Assignments aligned with Liberal Studies Learning Outcomes** | |  |  |  | | --- | --- | --- | | **Deliverables** | **Description** | **Liberal Studies Learning Outcomes** | | **Peer Reviewed Research** | Students undertake extensive research to identify the problem research technical solutions (e.g., background research on the client and site, literature review for a research project, or technology research for a design project. Students apply existing scientific and engineering knowledge to understand a problem. | Critical Thinking (Science and Applied Science Distribution Block) | | **Project Need, Goals, and Scope** | After extensive research, students will identify project needs, goal, and scope. | Critical Thinking, | | **Design, Design Calculations, Prototype** | Students develop designs and calculations specific to the team’s project needs. Each team determines how they will prototype their project (e.g., sample research protocol, virtual model, or physical model. Students use quantitative methods, research, and/or prototyping to evaluate a problem and test alternatives. | Quantitative Reasoning (Science and Applied Science Distribution Block) | | **Logbooks** | Students will keep detailed logbooks throughout the duration of the project. Logbooks document quality entries including annotated bibliographies of peer reviewed research, sketches, designs, calculations, and other pertinent thoughts and efforts to solve and engineering problem. | Effective Writing, Quantitative Reasoning, Critical Thinking  (Science and Applied Science Distribution Block) | | **Peer Evaluations** | Peer evaluations occur multiple times during the semester. The initial peer evaluations will provide feedback to individuals about strengths and areas for improvement. The final peer evaluation may modify individual grades. |  | | **Presentations** | Each team will present a mid-term presentation and a final proposal presentation | Effective Oral Communication | | **Final Design Recommendations and Schedule or a Research Plan and Schedule for 486C** | During the pre-capstone course, students prepare a proposal for their second semester capstone program. The proposal identifies client specific needs, project scope, peer reviewed research, budget and financial analysis, and a proposed management plan. This process uses skills acquired in their major to solve a problem. | Critical Thinking, Effective Writing  (Science and Applied Science Distribution Block) | | **Final Exam** | This course does not have a final exam. |  | | |
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| **Grading System** | You will be evaluated on the learning outcomes (listed above), according to the following weighting:   |  |  | | --- | --- | | **Assessment** | **Percentage** | | **Attendance/participation** | Multiplier | | **Individual Assignments/Logbooks** | 50% | | **Team Assignments** | 50% |   **Attendance & Class Participation**   * Attendance is mandatory. Attendance and participation will be evaluated through completion of in-class activities. * Additional information about the attendance and tardiness policies are provided below. * The attendance multiplier will affect your final grade as follows:  |  |  | | --- | --- | | **# of Absences** | **Multiplier** | | **0 to 3** | 1.000 | | **more than 3** | 1.000 - 0.012 \* (# of absences - 3)2 |  * You cannot pass the class if you miss more than 4 weeks of classes. You can miss three classes and not incur a penalty. Do not come to class if you are sick. You will be asked to leave.   Final grades will be assigned using the following scale:   |  |  | | --- | --- | | **Letter Grade** | **Numeric Grade** | | **A** | 90 to 100 | | **B** | 80 to 89 | | **C** | 70 to 79 | | **D** | 60 to 69 | | **F** | 59 or below | | |
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| **Readings and Materials** | No textbook required. Readings and materials will be provided on Bb Learn. | |
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| **Course Policies** | Professional engineers must abide by workplace policies, and similarly as an engineering student, you must abide by academic (<http://nau.edu/Student-Life/Student-Handbook/Academic-Policies/>) and course policies.  **Attendance**  There is a clear link between success and class attendance. By attending class, not only will you be learning from your peers, there is also important content delivered in class. If you must miss any class session, you are expected to deal with your absence professionally (only those with documented illnesses or university approved absences – will be allowed to make up any in-class assignments). Excessive absence, lack of preparedness, or late arrival, especially those that are not handled in a professional manner, will likely result in a lower course grade.  **Use of Electronic Devices and Computers During Class**  Electronic devices are tools. Please use them respectfully and professionally. If you need to take a call while in class, please step outside of the classroom. Laptop computers and tablet devices are to be used only to take class notes. They are not to be used for any activities unrelated to class (for example, checking emails or working on assignments).  **Work**   * Individual homework assignments will be assigned periodically throughout the semester to reinforce the material presented in class. *A hardcopy of all Homework in Memo Format will be collected at the beginning of class. Please print your work out prior to the start of class.*   + If requested, Electronic homework will be submitted on Bb Learn in PDF format by the specified deadline. * ***All assignments must be neatly presented.*** * Any homework that is not professionally presented will be returned with a grade of zero. * As a general rule, you are expected to work two hours outside of class for every hour in class. For a one unit class, this means that you can expect to work two hours a week outside of the classroom.   **Late Work**   * ***Late homework and projects are not accepted unless there is a documented illness or university approved absence.*** All assignments are due at the beginning of class and will be collected before any class activities begin.   **Plagiarism and Cheating**   * You are expected to behave professionally during this course. This means that individual coursework will be completed individually. You are encouraged to discuss assignments, but you may not submit another’s work as your own. * On all assignments, any sources of information that are not the original creation of the author must be cited in sufficient detail that the instructor can locate and verify the sources. * If you are repeating this class, you may not use work that you completed for a previous class.   Plagiarism and cheating are subject to the Arizona Board of Regents Code of Conduct procedures as outlined in the NAU Student Handbook. | |
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| **University Policies** | Please review the following NAU Academic Policy Statements (<http://www4.nau.edu/avpaa/UCCPolicy/plcystmt.html>):   * Safe Environment Policy * Students With Disabilities * Institutional Review Board * Academic Integrity * Academic Contact Hour Policy * Sensitive Course Materials   NAU Classroom Disruption Policy: <http://nau.edu/uploadedFiles/Administrative/EMSA_Sites/Folder_Templates/_Forms/Classroom_Disruption_Policy.pdf>  Revised Professional Code of Ethics statement: <http://nau.edu/uploadedFiles/Academic/CEFNS/Forms/engineering%20students%20professional.pdf>  Student Handbook: <http://nau.edu/Student-Life/Student-Handbook/> | |
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| **About Design4Practice (D4P)** | Design4Practice (D4P) consists of a sequence of design courses that span the freshman to senior years in all engineering degree programs at NAU. The D4P courses are designed to prepare students for an engineering corporate environment, which requires the synthesis of technical knowledge and skills as well as a proficiency in a variety of professional skills. The four “pillars” of the D4P are 1) Engineering Design, 2) Communication, 3) Teamwork, and 4) Professionalism.  **D4P Courses:**   * EGR 186 – Introduction to Engineering Design * CENE 286; EE 286; ME 286 – Engineering Design: The Process * EGR 386W – Engineering Design: The Methods * Capstone courses: EGR 476C & 486C; CENE 476 & 486C; EE 476C & 486C; ME 476C & 486C   For additional information about D4P, visit <http://nau.edu/D4P/>. | |