

ENGR 16100 – FALL 2022

Honors Introduction to Innovation and the Physical Science of Engineering Design I (4 credits)

COURSE INFORMATION:

Sections H09/H10 (CRN 29458/29459): MWF, 3:35 pm – 5:20 pm; Shreve C-111; “Section 1”

Sections H01/H02 (CRN 19049/19058): MWF, 9:35 am – 11:20 am; Shreve C-111; “Section 2”

Sections H03/H04 (CRN 19050/19059): MWF, 11:35 am – 1:20 pm; Shreve C-111; “Section 3”

Sections H07/H08 (CRN 19056/19061): MWF, 1:35 pm – 3:20 pm; Shreve C-111; “Section 4”

Sections H05/H06 (CRN 19055/19060): MWF, 3:35 pm – 5:20 pm; Shreve C-111; “Section 5”

Instructional Modality: Face-to-Face

Note: Official Purdue sections designations for this class are indicated at the left of each line above. On the right of each line, in quotes, is the informal section designation that will be used by the Instructional Team.

COURSE PREREQUISITES:

Enrollment in this course requires prior admission to both the First-Year Engineering program (or the Pre-Agricultural and Biological Engineering program) and the Honors College or the Goss Scholars Learning Community.

INSTRUCTOR CONTACT INFORMATION:

- Dr. Sean Brophy (sbrophy@purdue.edu): ARMS 1217; 496-3316
- Dr. Jacqueline Linnes (jlinnes@purdue.edu): POTR 322C; 496-1012
- Dr. Joseph Lyon (lyonj@purdue.edu): POTR 322; 496-1456
- Dr. Timothy Whalen (whalen@purdue.edu): SHRV C-139; 494-4473

Note: all office hours with instructors are by appointment. The best way to set up an appointment is to send an email to your instructor at the address listed above. For students in Dr. Linnes’ section, it is strongly recommended that you CC Melissa Hale (haleme@purdue.edu) on your email. In your email, please provide 2 or 3 suggestions for blocks of time you would be available for an appointment.

GRADUATE TEACHING ASSISTANT CONTACT INFORMATION:

- Karl Akert: kakert@purdue.edu
- Jose Ortiz Flores: jortizfl@purdue.edu
- Aaron Guo: guo484@purdue.edu
- Grigorii Rudakov: grudakov@purdue.edu
- Cody Waldecker: cwaldeck@purdue.edu
- Andy Wilcox: wilcox64@purdue.edu

COURSE OFFICE HOURS:

Information regarding office hours will be posted to the course Brightspace page during the first week of classes. No office hours will be held during the first week of classes.

COURSE DESCRIPTION & LEARNING OBJECTIVES:

This course introduces students to the engineering profession using physics-based, multidisciplinary, societally relevant content. Students develop engineering approaches to systems, generate and explore creative and innovative ideas, and use of computational methods to support design decisions. In particular, the students will develop the ability to model and investigate physical systems at the microscopic and macroscopic levels with a focus on vector analysis, linear momentum, angular momentum, work-energy, and solid material interactions. Design challenges and projects will explore a wide range of natural phenomena experimentally and computationally (utilizing Matlab and Python) and engage students in innovative thinking across the engineering disciplines at Purdue. They will learn the basics of descriptive statistics, data analysis, sensitivity analysis, and decision making. Students experience the process of design and analysis in engineering including how to work effectively in teams. Students also develop skills in project management, engineering fundamentals, oral and graphical communication, logical thinking, and modern engineering tools. Typically offered Fall.

Successful completion of this course will enable a student to:

1. Discuss the engineering education process, courses, and options, ask informed questions about engineering job functions and opportunities, and use this information to prepare a moderately well-informed course of study for academic and career success.
2. Employ formal strategies, including project organization and time management techniques, to thoughtfully pursue course activities.
3. Plan and implement systematic design processes using formal engineering management and design tools such as work breakdown structures, technical requirements and functional block diagrams to design innovative products and systems.
4. Create analytical and/or computational models of engineering systems that can be employed to better understand or control the systems.
5. Describe a wide range of engineering and physical phenomena using fundamental physical laws.
6. Translate logical procedures or processes into algorithms that can be implemented in computational environments.
7. Demonstrate professional communication skills in the areas of technical writing to produce engineering reports, in presentations to convey engineering evidence and findings verbally and graphically to audiences, and in record-keeping to document the design process for other engineers.

8. Apply knowledge regarding effective team roles, norms, and stages of development to work alongside individuals with diverse backgrounds and accomplish engineering tasks.
9. Evaluate engineering problems to reach evidence-based conclusions, drawing upon one or more sources of information and data interpretation skills.
10. Incorporate the consideration of engineering ethics, including social, safety, and sustainability issues into instances of engineering thinking and engineering problem solving so that the broader impacts of engineering work are evaluated and accounted for.
11. Apply fundamental engineering skills and knowledge relating to units, dimensions, estimation, visualization, significant digits, vectors, and the problem presentation method to engineering applications.
12. Display proficiency in the applications of engineering content knowledge including computer-aided drawing and basic statistics.

COURSE EXPECTATIONS:

You are expected to:

1. Be an active contributor to in-class discussion and problem-solving activities.
2. Be prepared and accountable for class by reading any assigned material ahead of time and be able to answer questions related to this material.
3. Be held accountable for all material in reading assignments, course documents, electronic communications, and other sources of course information, regardless of whether the material is explicitly discussed in class or not.
4. Attend class because of a community expectation to learn from each other.
5. Be cooperative with your team and work with them, not compete against them.
6. Learn interdependently with your team and your peers.
7. Learn to be accountable to your team and have your team be accountable to you.
8. Be prepared to meet with your team outside of class to complete assignments.
9. Rely on your peers, as well as the instructional team, to learn the course material.

COURSE GRADE COMPUTATION:

3 Midterm Exams; each worth 12%	36%
Homework	20%
Ready Assessment Trials (RAT's)	2%
Checks for Understanding (CFU's)	6%
Design Challenges and Lab Activities	5%
Project 1	3%
Project 2	10%
Project 3	18%
Completion of "Engineering Your Major" (EYM) Assignment*	<u>S/U</u>
Total	100%

* See the section "ENGINEERING YOUR MAJOR" Assignment below for more details.

COURSE GRADE COMPUTATION NOTES:

This course will make extensive use of student teams. As such, homework, activities, ready assessment trials (RAT's), checks for understanding (CFU's), and project grades may reflect some combination, in part or as a whole, of your individual effort and teamwork. Exam grades will, in their entirety, represent your individual understanding of the course material. In general, your final course grade will consist of no less than 64% of your own individual contributions. You are reminded that learning team accountability (your accountability to the team and the team's accountability to you) is an essential element of this course. As such, the course instructor reserves the right to use: materials submitted by your team to reflect your individual effort in the form of a grade; materials submitted by individuals to reflect your team's effort in the form of a grade; materials randomly collected by individuals to reflect your team's effort in the form of a grade; the weakest material submitted by individuals to reflect your team's effort in the form of a grade; or materials submitted by pairs of team members to reflect your individual or team effort in the form of a grade.

The following grading scale will be used to determine your semester course grade:

$90\% \leq A < 100\%$, $80\% \leq B < 90\%$, $70\% \leq C < 80\%$, $60\% \leq D < 70\%$, and $F < 60\%$

You are, at a minimum, guaranteed a letter grade for the course that corresponds to your course grade percentage as determined by the course grade computation (see above). However, the course instructor reserves the right to review a borderline student on a case-by-case basis. Factors that may be used to evaluate such cases may include: class attendance, participation, teaming, grade improvement, consistent homework completion, bonus completion, and the like.

Consistent with the policies described below, please be aware that failure to complete the "Engineering Your Major" (EYM) assignment will result in receiving a letter grade of F, regardless of your current numeric score.

REQUIRED TEXT BOOK:

There is no required textbook to be purchased for this course. Reading assignments will be made available online via Brightspace or distributed to students in class during the course.

OTHER REFERENCE MATERIALS:

These materials are recommended references:

1. National Academy of Engineering, "Grand Challenges for Engineering", available at <http://www.engineeringchallenges.org/>, last accessed 08/2016.
2. Programming references for Fall:
 - Programming in Python 3, 2nd Edition
Author: Summerfield
Publisher: Addison Wesley
ISBN 978-0-321-68056-3

IMPORTANT DATES: (EXAM, CFU, AND PROJECT DATES ARE TENTATIVE)

August 22 – Classes start

August 26 – Project 1 released

September 5 – Labor Day (no classes)

September 9 – CFU #1 (in class)

September 14 – Project 1 Demonstration (outside of class)

September 16 – Project 1 Executive Summary to be submitted electronically

September 19 – Project 3 released

October 3 – Exam #1 (in class)

October 10 – October Break (no classes)

October 21 – CFU #2 (in class)

October 24 – Project 2 released

October 31 – Exam #2 (in class)

November 7 – Project 2 Presentations (in class)

November 9 – Project 2 Report to be submitted electronically

November 14 – CFU #3

November 23 - 25 – Thanksgiving Break (no classes)

November 30 – Exam #3 (in class)

December 5 – Project 3 Demonstration (outside of class)

December 7 – Project 3 Presentations (in class)

December 9 – Project 2 Report to be submitted electronically

December 10 – Last day of all Fall classes

December 12 -17 – Final Exam week

ENGINEERING YOUR MAJOR (EYM) Assignment:

The Engineering Your Major (EYM) assignment is an opportunity for you to learn more about the various options and potential careers in selected fields of engineering, as well as having you investigate how Purdue's engineering degree programs prepare you for these fields. You will be provided with specific details concerning this assignment during the first week of class, including requirements, due dates, and other relevant details. Because of the potential impact that this assignment can have on your academic and professional career, it is **mandatory** to complete this assignment in a satisfactory manner. Students who do not complete this assignment in a satisfactory manner will be given a failing grade for the class **regardless** of their performance on other aspects of the course.

CAMPUS EMERGENCIES

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email. You are expected to read your @purdue.edu email on a frequent basis.

ATTENDANCE:

As indicated in the Course Expectations, you are expected to attend ALL classes. In the current context of COVID-19, students should stay home and contact the Protect Purdue Health Center (496-INFO) if they feel ill, have any symptoms associated with COVID-19, or suspect they have been exposed to the virus. Students should also contact their instructor (not their Grad TA or Peer TA) to make the instructor aware of the situation and discuss further steps as needed.

In keeping with Purdue's Class Attendance and Absence Reporting Policy (see <http://www.purdue.edu/odos/services/classabsence.php>), only your instructor can excuse you from classes or course responsibilities; no one else has this authority. For this course, excusable absences are limited to: medically excused absences; extended absences as documented by the Office of the Dean of Students; or Purdue sponsored events (e.g., conferences, club activities, varsity athletics, etc.) that do not conflict with an exam. Other situations (e.g., interviews, religious observances, personal events, etc.) may be excused at the discretion of your instructor. Be aware that having grounds for an excusable absence does not necessarily guarantee that you will obtain instructor permission to miss class or course responsibilities.

In the case of foreseeable events (e.g., Purdue sanctioned events with known dates, scheduled medical procedures, etc.), students are expected to provide appropriate documentation of the event prior to its occurrence with sufficient time for the instructor to make a decision about the suitability of the absence. In particular, if the event is Purdue sanctioned, students should have a person in authority with respect to this event send a request to your instructor to excuse the absence. In general, the person in authority should be a member of the faculty, staff, or administration; however, requests from other persons will be considered on a case-by-case basis. Instructors reserve the right to decline to excuse an absence, with the understanding that such a decision must be consistent with the Purdue policy referenced above.

In all cases where a student is requesting an excused absence, the student is expected to make a good faith effort to notify the course instructor in a timely fashion (prior to a class is considered timely, after the fact is generally not unless there are extenuating circumstances). The instructor may request further documentation to corroborate your request. Once an absence is approved, you will have one week to make arrangements with your course instructor for a means of making up any material you missed.

When the student is unable to make direct contact with the instructor and is unable to leave word with the instructor because of circumstances beyond the student's control, and in cases of bereavement, quarantine, or isolation, the student or the student's representative should contact the Office of the Dean of Students via email at odos@purdue.edu or phone at 765-494-1747.

Please note: students having an excessive number of unexcused absences (defined as more than 10% of the regularly scheduled class meetings) will automatically be dropped one letter grade regardless of their class standing.

CLASSROOM GUIDANCE REGARDING PROTECT PURDUE

The Protect Purdue Plan (<https://protect.purdue.edu/plan/>), which includes the Protect Purdue Pledge (<https://protect.purdue.edu/pledge/>) is campus policy and as such all members of the Purdue community must comply with the required health and safety guidelines. Required behaviors in this class include: staying home and contacting the Protect Purdue Health Center (496-INFO) if you feel ill or know you have been exposed to the virus, disinfecting desk/workspace prior to use, maintaining appropriate social distancing with peers and instructors (including when entering/exiting classrooms), avoiding shared use of personal items, maintaining robust hygiene (e.g., handwashing, disposal of tissues) prior to, during and after class, and following all safety directions from the instructor.

Students who are not engaging in these behaviors will be offered the opportunity to comply. If non-compliance continues, possible results include instructors asking the student to leave class and instructors dismissing the whole class. Students who do not comply with the required health behaviors are violating the University Code of Conduct and will be reported to the Dean of Students Office with sanctions ranging from educational requirements to dismissal from the university.

Any student who has substantial reason to believe that another person in a campus room (e.g., classroom) is threatening the safety of others by not complying (e.g., not wearing a mask) may leave the room without consequence. The student is encouraged to report the behavior to and discuss next steps with their instructor. Students also have the option of reporting the behavior to the Office of the Student Rights and Responsibilities. See also the Purdue University Bill of Student Rights.

(<https://catalog.purdue.edu/content.php?catoid=7&navoid=2852#purdue-university-bill-of-student-rights>).

ACADEMIC INTEGRITY:

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern.

You are expected to abide by the Purdue University Student Code of Conduct (see http://www.purdue.edu/usp/acad_policies/student_code.shtml). Turning in work that is not your own or any other form of scholastic dishonesty will result in a grade of zero (0) on an assignment/exam and may result in a grade of F for the entire course. Should the circumstances warrant a grade of F in the course, your name will automatically be forwarded to the Office of the Dean of Students. In addition, knowingly aiding and abetting, directly or indirectly, other parties in committing dishonest acts is in itself dishonest. In such cases, all parties involved will receive a zero (0) on the assignment/exam and may result in a grade of F for the entire course. Should the latter be necessary, the names of all those involved will be forwarded to the Office of the Dean of Students.

You are also encouraged to review Purdue's Honor Pledge, which can be found at <https://www.purdue.edu/provost/teachinglearning/honor-pledge.html>. You will be signing a version of this honor pledge prior to submitting all exams and other key assignments.

Please pay special attention to the following paragraph regarding teamwork (or working collaboratively with others). During this course, you will be working in teams and as such you are expected, and will be encouraged, to help each other. This is done because it has been shown that students learn more effectively while working together. Since course grades are not curved, there is no penalty for helping someone else. However, there is, at times, confusion over when it is OK to “collaborate with a teammate (or someone in the course)” and when collaborating with someone else turns into academic dishonesty.

When an assignment specifies that it is:

1. **ALL-CLASS Assignment** – you should feel comfortable talking to anyone in the course (and working side-by-side with them) about any aspect of an assignment from gaining conceptual insight to developing an appropriate model to specifying assumptions to writing out a solution. If the assignment was to develop some kind of computer tool model/solution, working side-by-side with other members of the course to gain conceptual insight, develop logic, outline syntax, and implement/debug said logic and syntax would be considered acceptable behavior. In such cases all individuals involved in the assignment should be appropriately acknowledged in the materials submitted.
2. **TEAM Assignment** – you should feel comfortable talking to anyone on your team (and working side-by-side with them) about any aspect of an assignment from

gaining conceptual insight to developing an appropriate model to specifying assumptions to writing out a solution. If the assignment was to develop some kind of computer tool model/solution, working side-by-side with other members of your team to gain conceptual insight, develop logic, outline syntax, and implement/debug said logic and syntax would be considered acceptable behavior. In such cases all individuals involved in the assignment should be appropriately acknowledged in the materials submitted.

3. **INDIVIDUAL Assignment** – you should feel comfortable talking to anyone in the course about an assignment to gain conceptual insight only. Any act other than having a “conceptual conversation,” even if mutually agreed upon, would be considered academic dishonesty. If the assignment was to develop some kind of computer tool model/solution, working with others to gain conceptual insight would be considered acceptable behavior. Any act other than having a “conceptual conversation” or “providing debugging insight,” even if mutually agreed upon, would be considered academic dishonesty.

COPYRIGHTED MATERIAL AND DERIVATIVE WORKS:

Please note that almost all documents produced by the Instructional Staff are copyrighted and thus are subject to Purdue University’s policies on the use of copyrighted materials. Please refer to Part 9 of the Purdue Student Miscellaneous Conduct regulations, which can be found at the following website:

<http://catalog.purdue.edu/content.php?catoid=8&navoid=8208#miscellaneous-conduct-regulations> . All other works produced by the Instructional Staff are considered to be

derivative works and thus subject to the policies outlined in Part 10 of the Purdue Student Miscellaneous Conduct regulations. In addition, notes taken by students in class are considered to be derivative works and subject to the same policies.

OTHER EXPECTATIONS, RULES, OR COMMENTS:

1. A “Failure to Follow Instructions” policy is in place, which penalizes you for repetitive or flagrant violations of assignment instructions. After two repetitive or flagrant violations of assignment instructions, your assignment will automatically be returned with a grade of zero (0) with no chance of redress.
2. Submission of course assignments is subject to the policies in the table on the following page. All submissions must be made using the mechanism indicated in the assignment or course materials; submissions made via a different mechanism can be rejected at the discretion of the course instructor. In certain circumstances a GTA or instructor can waive a given submission policy or mechanism **prior** to the submission; students are expected to contact the appropriate person immediately if they wish to request an exception to a certain policy.
3. When submitting course assignments electronically, only the final submission will be graded. You should include all relevant files in the final submission. It is

recommended that you confirm all electronic submissions have been successful to ensure that your work will be graded.

4. Hand-written work:

- All hand-written homework will be submitted on engineering paper.
- All hand-written work will be submitted with your name, your team number and section number printed in the upper right hand corner of your paper. In addition, you must sign your work below your name. Your signature indicates *“this is my work and I have a general understanding of all the information that is being submitted.”*

Deliverable Type	Policies
Exams	<ul style="list-style-type: none"> • Penalties for late submission at instructor’s discretion. • Missed exams due to an excused absence must be made up within one week from original exam date unless otherwise indicated by instructor. • Students must contact their instructor as soon as possible after the exam to determine steps for making up an exam.
Readiness Assessment Tests (RATs)	<ul style="list-style-type: none"> • No late submissions accepted. • Missed RATs cannot be made up.
Homework Assignments Design Challenges	<ul style="list-style-type: none"> • Flat 30% penalty if submitted within 24 hours of on time. • No submissions accepted after 24 hours of on time.
Check For Understanding (CFU's)	<ul style="list-style-type: none"> • Penalties for late submission at instructor’s discretion. • Missed CFUs due to an excused absence must be made up within one week from original CFU date unless otherwise indicated by instructor. • Students must contact their instructor as soon as possible after the CFU to determine steps for making up the CFU.
Project Reports Project Presentations	<ul style="list-style-type: none"> • 5% of deliverable value for up to 15 minutes after the time due, assessed at timestamp of GTA email receipt. • After 15 minutes, flat 30% penalty for submission up to 24 hours late. • No submissions accepted after 24 hours.

Bonus Assignments Project Notebooks Project Design Spec Reviews Requests For Additional Information (RFAI)	No late submissions accepted.
Kit inventory sheets PoC specifications Other not-for-credit Project deliverables	1% OVERALL project score penalty

- When submitting a team hand-written homework, you should follow the same rules as stated above, except making sure to include the names of all the team members that participated. In the case of a team assignment, the signature of each individual below his/her name communicates *“I was an active participant in preparing this document and I have a general understanding of all the information that is being submitted.”*
5. Computer Tool Assignments:
- You need to follow the Code Standard associated with the particular computer tool to receive maximum credit.
 - Computer tool assignments will always be submitted using the appropriate header that includes your name, your team number, and your section ID.
 - You will always provide an electronic signature (signature: your full name). Your electronic signature on an individual homework assignment indicates, *“this is my work and I have not collaborated with other individuals (other than the teaching team) to obtain the final materials being submitted.”* Your electronic signature on a team homework assignment indicates, *“I was an active participant in preparing the materials and I have a general understanding of all the information that is being submitted.”*
6. A late penalty will be assessed to any team assignment submitted late because a team member fails to act responsibly, even if it was completed on time.

NONDISCRIMINATION POLICY STATEMENT:

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. Purdue’s nondiscrimination policy may be found at http://www.purdue.edu/purdue/ea_eou_statement.html.

MENTAL HEALTH STATEMENT:

Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at (765)494-6995 and <http://www.purdue.edu/caps/> during and after hours, on weekends and holidays, or by going to the CAPS office of the second floor of the Purdue University Student Health Center (PUSH) during business hours.

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try WellTrack. (<https://purdue.welltrack.com/>) Sign in and find information and tools at your fingertips, available to you at any time.

If you need support and information about options and resources, please contact or see the Office of the Dean of Students (<http://www.purdue.edu/odos>). Call 765-494-1747. Hours of operation are M-F, 8 am- 5 pm.

If you find yourself struggling to find a healthy balance between academics, social life, stress, etc., sign up for free one-on-one virtual or in-person sessions with a Purdue Wellness Coach at RecWell (<https://www.purdue.edu/recwell/fitness-wellness/wellness/one-on-one-coaching/wellness-coaching.php>). Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is completely free and can be done on BoilerConnect. If you have any questions, please contact Purdue Wellness at evans240@purdue.edu.

ACCESSIBILITY AND ACCOMMODATIONS STATEMENT:

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at drc@purdue.edu or by phone at 765-494-1247.

BASIC NEEDS SECURITY STATEMENT:

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. There is no appointment needed and Student Support Services is available to serve students 8 a.m.-5 p.m. Monday through Friday. Considering the significant disruptions caused by the current global crisis as it related to COVID-19, students may submit requests for emergency assistance from the [Critical Needs Fund](#) .