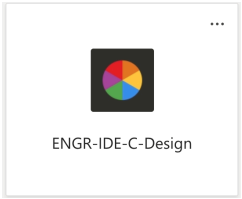

IDE 48500: Interdisciplinary Design

MW 3:30 to 5:20, F 3:30 to 4:20
ARMS B098B including Demonstration & Innovation Studios
Microsoft Teams Virtual Workspace (same workspace as IDE 484)
Instructor: Dr. Robin Adams (she/hers), Wang 4566, rsadams@purdue.edu, 765-490-1506 (cell)
Office hours: In **Microsoft Teams,** by appointment or doing open studio time (TBD)

GOALS

1. Provide a team-based, capstone design project experience which requires an interdisciplinary approach and uses knowledge and skills acquired in earlier course work in the Interdisciplinary Engineering program.
2. Undertake an industry-sourced design project and thereby demonstrate the application of appropriate engineering standards and multiple realistic constraints.
3. Extend the professional skills of the students in preparation for professional practice.

This course offers an integrated content spine bringing together interdisciplinarity, design, teamwork, and professional practice concepts and strategies. Students work in teams on industry-sourced design projects and present their work over the term through Project Milestone Reviews that parallel professional workplace practice. Teams of 3-5 students will conduct research that integrates diverse perspectives to identify a relevant human or social need and then proceed through multiple project milestone reviews to validate this need, establish performance requirements, and deliver a desirable, feasible, viable, and sustainable solution with evidence validating requirements are met.

PREREQUISITES

- Senior standing and program approved engineering design course (IDE 484000)
- Engineering economics (IDE 48300, IE 34300, or equivalent)
- Mathematics (MA 26200 or MA 26500 & 26600)
- Pre-or co-requisite IDE 30100
- Departmental permission, if applicable

LEARNING GOALS

As a culminating and integrative capstone experience, a student who successfully completes this course is expected to enhance abilities initially developed through prior coursework and extracurricular activities, with emphasis on:

Demonstrate the appropriate use of informed designing practices.	Work products, particularly Milestone Reviews (M2-5) and the Final Report (M6) should demonstrate an ability to: • Use **research, problem framing** and **strategic iteration** practices – to produce a validated and well-reasoned problem statement (with clear objectives, scope of work, and requirements a solution must achieve) • Use **research, idea fluency, deep modeling**, and **strategic iteration** practices – to produce solution options that hold promise for addressing the design problem • Use **deep modeling** and **balancing trade-offs** practices – to compare solution options and justify the most promising solution for delivery • Use **valid tasting** and **diagnostic troubleshooting** practices – to refine and validate a chosen solution • Use **strategic iteration** and **reflective thinking** practices to - revise and update problem statement and solutions as needed
Demonstrate the appropriate use of interdisciplinary thinking practices	All work products should demonstrate an ability to: • Seek out, be receptive to, and integrate **diverse perspectives and alternative viewpoints**, even those with which you may disagree • Describe the **broad context** of a problem situation by placing it in the fabric of time, culture, or personal experience • Describe a problem as a **system** of interconnecting entities • **Integrate** relevant information from different sources and perspectives to generate a comprehensive understanding • **Integrate** multiple **Design as X** values for responsible design (e.g., desirability, feasibility, viability, environmental impact, infrastructure) • **Critically reflect** on your own perspective and receptiveness to other perspectives

Demonstrate effective communication	Work products should demonstrate an ability to: • Externalize and represent thinking in a variety of formats (sketches, diagrams, physical artifacts) • Competently communicate ideas (visual, writing, oral presentation, physical artifacts) • Deliver effective presentations (informal/impromptu and formal) as a member of a team to multiple internal and external stakeholders that contribute to design project progress • Produce professional quality design project documentation that tracks decision making and team knowledge
Make knowledge explicit in ways that support continual learning and preparation for future success	Work products, particularly your Interdisciplinary Design Playbook, should demonstrate an ability to use reflective practice strategies to: • Explain informed designing practices and how, why, and when they are useful • Explain interdisciplinary thinking practices and how and why they are useful • Explain benefits of interdisciplinary design approach to complex socio-technical problems and risks of not doing so
Demonstrate team effectiveness	Work products, particularly your Team Management Plan and Team Process Improvements and Accomplishments**,** should demonstrate an ability to: • Contribute as a professional by being punctual, prepared, and substantively enable team success • Understand and leverage the diverse perspectives of team members • Identify and use techniques to monitor and maintain team effectiveness • Identify and use techniques to effectively manage projects and team decision making • Identify and use knowledge management tools to effectively archive and document design information

INSTRUCTIONAL APPROACH

My approach is a mix of delivering content on a just-in-time basis, informal coaching, informal and formal review sessions, and to the extent possible inviting subject matter experts to class. I strive to help each student deepen their understanding of interdisciplinary design practices and each team to successfully define an important problem to address and deliver a working solution to that problem.

CLASS SESSIONS, PARTICIPATION, AND COLLABORATIVE WORKSPACE

Schedule: Class meets face to face every **Monday and Wednesday for 110 minutes, and on Friday for 50 minutes**. Mondays and Wednesdays will be used primarily for just-in-time lectures, coaching, and team work. Informal and formal Project Milestone Reviews will occur during Monday and Wednesday sessions. We will use the same **Microsoft Teams** platform for IDE 484 – all materials, worksheets and resources for both IDE 484 and 485 will be in this shared space. COVID-19 Addition: Should we need to change from a face-to-face to a virtual format, we will rely on Teams to support videoconferencing, access to course content and materials, assignments and grades, and chat forums. A brief check in meeting will occur Mondays from 3:30 to 4:00, and teams will schedule a 25-minute coaching meeting with the instructor at least 2 times a week during regular class sessions. If your access to the internet is difficult or sporadic, please let me know so we can explore alternatives.

Participation: Success depends on all students participating fully and contributing equitably to the team effort. Students are expected to attend all class sessions and remain for their duration, unless they are ill or otherwise unable to attend class (e.g., bereavement, quarantine, job interview, etc.). If you must miss a class, alert the instructor and your team at least 3 hours in advance so they may plan accordingly. Students who need to attend virtually (e.g., Covid19 tests or quarantines, etc.) can join class synchronously via Teams. Videos of class sessions and transcripts will be posted on Teams.

Time Commitment: Students should plan to commit at least 6-9 hours out of class to meet project deliverables. Capstone courses are prone to unexpected and time-intensive challenges – it will be critical to monitor and manage time effectively.

Fabrication Facilities: The Demonstration & Innovation Studios (ARMS B098) has resources for group brainstorming and team activities (movable whiteboards, sticky notes, etc.), low fidelity prototyping (cardboard, plastic, tape, rubber bands, etc.), 3D prototyping (managed through the 3D Printing Club), and private space for user testing, interviews, or focus groups. Tentatively, teams may have access to the Demonstration and Innovation Studios (adjacent to B098) from 12:30 to 3:30 MWF – prior to class. Because of Covid-19, students cannot access the space without an instructor being present; we will need to work together to find a way to effectively schedule the space. Another resource is the Bechtel Innovation Design Center (BIDC) that supports 3D printing, wood and metal working, electronics, paint booths,

and welding. Due to Covid-19, the BIDC will not be open for students to fabricate their own work, but students may set up job requests to be completed by BIDC members via Discord (https://www.purdue.edu/bidc/get-started/). If you plan to use the BIDC or the 3D Printing Club – plan ahead and do not assume access will be available or quick towards the end of the term.

Sketchbook: Students are encouraged to have a sketchbook, journal, or digital tablet that allows you to sketch with a stylus with you at all times as a means for developing ideas, discovering insights, exploring concepts, and documenting lessons learned or revisions.

COURSE ASSIGNMENTS

This is a project course, there is no final examination. Assessment of performance in this course will be done progressively over the semester. Assignments and related materials will be posted in Teams. There are 4 types of assignments: Safety badges, Project Milestone Reviews, Team Process Assignments, and the final iteration on your Interdisciplinary Design Playbook (from IDE 484).

Grading: The scale for course grades will be A (90-100); B (80-89); C (70-79) etc. Final grades are based on the weighted sum of marks received during the semester from the various assessment items listed below. Final scores may be adjusted at the discretion of the instructors based on overall class participation. In the current context of COVID-19, participation is not graded; however, after 4 absences, I will contact you to understand your circumstances and discuss the impact of your lack of participation on assignments. *Note: Approved MDE capstone design courses, and any pre-requisite course to an approved MDE capstone course, must be successfully completed and passed with a C- or better to meet graduation requirements. Failure to meet this threshold will require a retaking of the course.*

COVID-19 AMENDMENT: 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. Changes in the course will be clearly communicated and disseminated as appropriate to the situation.

ASSIGNMENT	DUE DATE	ASSESSMENT
Safety Badges		
BIDC Safety Badge "Manufacturing Safety PPE" (Individual)	Feb 12, Fri	Pass badge certification
Project Milestone Reviews		**50% of grade**
Tentative: Engagement Session with Subject Matter Experts	TBD	n/a
M2: Problem Frame Review (Informal)	Feb 8-10, MW	"Pass / No pass" with feedback
M3: Solution Options Review (Informal)	Feb 24-26, WF	"Pass / No pass" with feedback
M4: Preliminary Design Review (Formal)	Mar 8-12, MWF	"Pass" for budget approval
M5: Final Design Review (Formal)	Apr 19-23, MWF	15% via rubric
M6: Final Design Report (Team)	Apr 30, Fri	35% via rubric
Team Process Assignments		**30% of grade**
M1: Team Management Plan	Jan 29, Fri	10%, Pass / No pass" with feedback
Mid-project Team Assessment Worksheets A&B (Individual)	Mar 5, Fri	5%
Mid-project Team Assessment Worksheet C (Individual)	Mar 17, Wed	
Mid-project Team Assessment Worksheets 1, 2, 3, revised Plan (Team)	Mar 9, Fri	5%
Final Team Achievements and Performance Worksheets (Team)	Apr 30, Fri	5%
Final Team Contribution & Lessons Learned Worksheets (Individual)	Apr 30, Fri	5%
Interdisciplinary Design Playbook		**20% of grade**
Playbook Worksheets	See schedule	Required for Playbook, graded as "participation"
Final Playbook (draft from IDE 484)	May 7, Thurs (finals week)	20% via rubric

Safety Badges: Safety Badges are required for working in the Demonstration and Innovation Studios. We will use the BIDC Passport System and require "passing" badge certification for Manufacturing Safety PPE for BIDC103. You may need to also complete the Member's Agreement. Additional badges may be assigned based on the nature of the project. (See: *General>Files → Course Materials>IDE485>Safety-Policy-Badges in Microsoft Teams*).

Design Milestone Reviews: Reviews parallel professional workplace practice and serve as a systematic mechanism for providing project feedback. Some are informal with one-on-one coaching from the instructor (M2, M3) and some are a formal presentation to the whole class with questions from the audience (M4 and M5). Early reviews emphasize establishing a problem frame, validating this frame and setting performance requirements, and investigating solution options. Later reviews emphasize justifying a preferred solution, and testing and troubleshooting solution performance to assure solution delivery.

Reviews are cumulative – each review updates key information from the previous review and adds new information. The Final Design Review and associated report will compile information updated from previous reviews with the addition of an executive summary, recommendations, and lessons learned. Overall, **teams are accountable to produce a well-reasoned problem frame validated by research, and deliver a solution with evidence verifying the solution meets or exceeds performance requirements**.

All reviews require a PowerPoint presentation (*uploaded before the review*) and physical artifacts (deep models, tests, simulations, etc.) to effectively communicate work-to-date. All reviews have an associated rubric or guideline (*General>Files→ Course Materials>IDE485>Project-Milestone-Reviews in Microsoft Teams*). Teams receive feedback after each review, and are expected to provide evidence of addressing feedback in the following review. **Teams will receive either a "pass" (approval to move to next review) or a "no pass" decision (with a list of required improvements and a deadline that must be passed to move to the next review).** Teams sign up for reviews for either Monday or Wednesday (Friday as needed for special cases). The two formal reviews (M4 and M5) will be scheduled to occur in a single extended-time session (see schedule).

Team Process Assignments: Students will form their own teams and complete a series of assignments to manage, monitor and improve team performance. Students completed a set of self-assessments (M4) and a summary of interests (CS10) in IDE 484. These will be used to form teams around shared interests that leverage member diversity.

Teams will create a *Team Management Plan* (Milestone 1, M1) with a team organization and leadership structure. The plan will describe how they will leverage diversity in skills and knowledge and work together to accomplish team functions (team relationships, individual and joint work, decision making, and information management), and plan their project (draft project timeline with roles, responsibilities, and time estimates).

At the term midpoint, teams complete *Midterm Team Assessment* worksheets to support team process improvements and improve team member contributions. Some worksheets are completed as individuals and some as a team. At the same time as the final report, teams submit *Final Team Achievements and Performance Worksheets* and individual members complete a *Final Team Contribution and Lessons Learned Worksheets.*

See: General>Files→ Course Materials>IDE485>Team Management Activities in Microsoft Teams.

Personal Interdisciplinary Design Playbook: The Playbook is an individualized summary of interdisciplinary design thinking practices with an emphasis on what they are and how to use different techniques, why the practices are beneficial or necessary, and when and why they are useful over the course of a project. Students created an initial version for IDE 484 and will extend these based on their experiences in this course and personalize their Playbook for what helps them learn. The overall purpose is to help students make their interdisciplinary design thinking knowledge "explicit" in ways that support lifelong learning and transfer to future situations. To support creating the Playbook, reflection assignments will be assigned throughout the term (see Schedule). See: *General>Files→ Course Materials>IDE485>Playbook Resources in Microsoft Teams*.

WEEKLY SCHEDULE

The instructor reserves the right to make any changes considered academically advisable. Changes will be announced in class to provide clear advance warning of any schedule changes. It is the student's responsibility to keep up to date with any changed policies and assignments. You are expected to attend scheduled classes; however, we recognize that some students in their final semester may need to attend job interviews. Class sessions in **BLUE** signify attendance is critical so do not plan interviews on these days/times. Assignments are in **GREEN**. Similar to IDE 484, assignments will reside in three places on Teams: the Collaboration Space ("CS" – e.g., 484 worksheets) as a shared space, personal Notebooks as a private space, and if the assignment requires an individual or team submission it will be in the gradebook. This may seem confusing at first, but this was done so assignments support collaborative work while providing a mechanism for feedback and grading.

Week	Day	Activities & Assignments
W1 Jan 19-22	M	*Martin Luther King Day – no class*
	W	Course Overview & Expectations; IDE 484 Review & Extension; Project Brief **Skills Bazaar and Team Formation** **For Friday: Review all M4 & CS10 files, collaboratively propose teams, post in Collaboration Space**
	F	Questions about Syllabus / Project Brief and Milestones? **Continue Skills Bazaar; Team Proposals and Diversity Audits**
W2 Jan 25-29	M	**Finalize teams – work towards M1 (Team Management Plan) and M2 (Problem Definition Review)** Mini lecture - Team Management Plan & Project Timelines; M1 overview & questions **Due: Review "TeamManagementPlan_Slidedeckv4" (Team_Management_Activities folder) and "M1-IDE 485 Team Contract Guide" (M1 assignment)** Team project time
	W	Mini lecture – Do Research, Problem Frame, Strategic Iteration (if time) **Due: Review P8 Worksheet & AdamsPlaybook (Do Research, Problem Frame, Strategic Iteration if time)** Team project time
	F	**Due: M1-Team Management Plan** Team project time; Check-in on project timelines & needs
W3 Feb 1-5	M	Debrief on M1; Overview of M2; Team project time Input: Engaging Subject Matter Experts; Keith Rhoads (Intertek) **Due: Review "M2-ProblemFrame_Review" guideline (M2 assignment)**
	W	Team project time
	F	Team project time; Check-in on project timelines & needs
W4 Feb 8-12	M	**M2 – Problem Definition Review (upload/share presentations via Teams)** Team project time (teams not presenting)
	W	**M2 – Problem Definition Review (upload/share presentations via Teams)** Team project time (teams not presenting)
	F	Mini lecture – Idea Fluency, Deep Modeling **Due: Review P8 Worksheet & AdamsPlaybook (Idea Fluency, Deep Modeling)** **Due: BIDC Safety Passport Badges (manufacturing safety PPE)**
W5 Feb 15-19	M	Debrief on M2, review M3 guide; Team project time **Due: Review "M3-SolutionOptions_Review" guideline (M3 assignment)** ***Update P8 Playbook (Do Research, Problem Frame, Strategic Iteration)***
	W	**Reading day – no class – may schedule use of Demo/Innovation Studio for team project time**
	F	Mini lecture – Balance Trade-offs, Diagnostic Troubleshooting (Failure Analysis); team project time **Due: Complete P9 worksheet; Review AdamsPlaybook (Balance Trade-offs)**
W6 Feb 22-26	M	Team project time
	W	**M3 – Solution Options Review (upload/share presentations via Teams)** Team project time (teams not presenting)
	F	**M3 – Solution Options Review (upload/share presentations via Teams)** Team project time (teams not presenting)
W7 Mar 1-5	M	Debrief on M3, review M4 guide; Team project time **Due: Review "M4-PreliminaryDesign_Review" guide (M4 assignment)**
	W	Team project time
	F	Team project time; Check-in on project timelines & needs **Due: Individual Mid-Project Team Assessment worksheets (Worksheets A and B)**
W8 Mar 8-12	M	**M4 – Preliminary Design Review (upload/share presentations via Teams)**
	W	**M4 – Preliminary Design Review (upload/share presentations via Teams)**
	F	**M4 – Preliminary Design Review (upload/share presentations via Teams)**
W9 Mar 15-19 (stress free)	M	Debrief on M4, review M5 guide, review Mid-Project Team Assessment; Team project time **Due: Review "M5-FinalDesign_Review" guide (M5 assignment) and Mid-Project Assessment (assignments for individuals and team)**
	W	Team project time **Due: Individual Mid-Project Team Assessment worksheets (Worksheet C)**
	F	Team project time; Check-in on project timelines & needs ***Update P8 Playbook (incorporate P9 and updates – Balance Trade-offs)*** **Due: Team Mid-Project Team Assessment worksheets 1-3 + updates to Plan**
W10 Mar 22-26	M	Mini lecture – Valid Testing; team project time **Due: Complete P10 worksheet; Review AdamsPlaybook (Valid Tests)**
	W	Mini lecture – Diagnostic Troubleshooting; team project time **Due: Complete P11 worksheet; Review AdamsPlaybook (Diagnostic Troubleshooting)**

	F	Team project time
W11 Mar 29- Apr 2	M	Team project time; Check-in on project timelines & needs
	W	Team project time
	F	Team project time ***Continually update P8 Playbook (incorporate remaining worksheets, updates, lessons learned)***
W12 Apr 5-9	M	Team project time; Check-in on project timelines & needs; review Final Playbook assignment **Due: Review "IDE485-IDP guidev1" guide (Playbook assignment) and example playbooks**
	W	Team project time
	F	Team project time ***Continually update P8 Playbook; work towards designing it for "you"***
W13 Apr 12-16	M	Team project time; Check-in on project timelines & needs
	W	Team project time
	F	Team project time ***Continually update P8 Playbook; work towards designing it for "you"***
W14 Apr 19-23	M	**M5 – Final Design Review Presentations**
	W	**M5 – Final Design Review Presentations**
	F	**M5 – Final Design Review Presentations – if needed**
W15 Apr 26-30 (dead week)	M	Debrief on M5, review M6 guide, review Final Team Accomplishment Worksheets; Team project time **Due: Review "M6-FinalDesign_Report" guide (M6 assignment) and Final Team Accomplishment Worksheets (assignments for individuals and team)**
	W	Team project time – prioritize and address M6 improvements
	F	Debrief on experience; sharing Playbook ideas **Due midnight: M6 and Final Team Accomplishment Worksheets**
Finals May 3-7	F	**Due at 6:00pm: Playbook**

COURSE CULTURE

Safe Practices: Students must follow safety guidelines in all work spaces: use and engage in safe practices and return the space and all tools and materials in a "better than found" 6S condition (sort, set, shine, standardize, sustain, safety).

COVID-19 Safe Practices: Required behaviors in this class include: staying homed and contacting the Protect Purdue Health Center (496-INFO) if you feel ill or know you have been exposed to the virus, properly wearing a mask in classrooms and campus building, at all times (e.g., mask covers nose and mouth, no eating/drinking in the classroom), disinfecting desk/workspace before and after use, maintaining appropriate social distancing with peers and instructors (including when entering/exiting classrooms), refraining from moving furniture, 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. If you are quarantined or if COVID-19 interferes with your ability to maintain virtual class engagement, please contact me so we can discuss how you can continue to learn and participate remotely. See: Protect Purdue website (https://protect.purdue.edu).

Culture of respect: This program is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person, and fosters mutual respect among its members. In this course, each voice has something of value to contribute to class discussion. Please respect the different experiences, beliefs and values expressed by your fellow students and instructor, and refrain from derogatory comments about other individuals, cultures, groups, or viewpoints. (See http://www.purdue.edu/diversity-inclusion/).

Behaving Professionally: All students are expected to behave in a courteous, respectful and ethical manner in all matters concerned with the course, adhering to the Purdue University Code of Honor. Acts of cheating, plagiarism or any other type of academic dishonesty will not be tolerated and will be dealt with according to Purdue's Policy on academic integrity.

Intellectual property: If you feel your work has the potential to benefit the public and is patent-eligible under the patent laws of the United States, it is your responsibility to familiarize yourself with Purdue's Intellectual Property policies and comply with the instructions provided. Resources are available on Teams regarding Intellectual Property (*General>Files → Class Materials>IDE485>Intellectual Property*). Because Teams is a collaborative space, work will be shared. In honor of intellectual property, these works should not be disseminated, sold, or bartered without express written permission. Any work used should be properly referenced to acknowledge the source.

STUDENT SUCCESS

Fundamentals Examination: **Students are strongly encouraged to take the NCEES Fundamentals Examination during their final semester**. There is financial support available to assist with the cost of taking this examination. Please contact Prof. Pilotte for more details on this opportunity.

Special accommodations: If you are a person with special circumstances that you believe will affect your class performance (e.g., visual, hearing or learning disabilities or language differences) you are welcome to let me know so we can discuss options regarding accommodations and/or classroom modifications. You are also encouraged to contact the Disability Resource Center by phone (765-494-1247) or email (drc@purdue.edu).

Mental health resources: 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 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. Other resources include WellTrack and Purdue Wellness Coach at RecWell.

Student support services and communities: There are many excellent resources on campus to help you be successful: Purdue Libraries, Division of Diversity & Inclusion, Purdue Veterans Success Program, Academic Success Center, Online Writing Lab (OWL), and ITaP Student Help for technology problems. For other issues, including the Grief Absence Policy and the Violent Behavior Policy, you should contact the Office of the Dean of Students.

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. Changes in the course will be disseminated on Teams, as appropriate to the situation. In preparation for the unlikely event of fires, tornadoes, or other hazards, please review the safety information posted in Armstrong Hall and on Purdue's emergency preparedness web site: http://www.purdue.edu/emergency_preparedness/. To further educate yourself**,** please **r**eview the **Emergency Procedures Guidelines**, at https://www.purdue.edu/emergency_preparedness/flipchart/index.html. The plan for Armstrong is available in the room and at: https://www.purdue.edu/ehps/emergency_preparedness/bep/arms-bep.html.

COURSE RESOURCES

There are two main textbooks – both are available as digital files through Purdue Libraries and were used for IDE484. Links are available on Teams (General>Files → Class Materials>Playbook Resources).

- Kees Dorst, Frame Innovation: https://ebookcentral.proquest.com/lib/purdue/detail.action?docID=3339962
- Vijay Kumar, 101 Design Methods: https://ebookcentral.proquest.com/lib/purdue/detail.action?docID=861699

Professor Adams' Interdisciplinary Design Playbook is also available on Teams – and reference the following sources:

- Beckman, S.L., & Barry, M. (2007). "Innovation as a Learning Process: Embedding Design Thinking." *California Management Review*, Vol 50 (1), pp. 25-56.
- Beckman, S.L., & Barry, M. (2009). "Design and Innovation through Storytelling." *International Journal of Innovation Science*, 1 (4), pp. 151-160.
- Brown, T. (2008). "Design Thinking". *Harvard Business Review*, June, pp. 84-95. See also: Ted Talk: http://www.youtube.com/watch?v=UAinLaT42xY
- Brown, T. (2009). *Change by Design: How design thinking transforms organizations and inspires innovation*. Harper & Collins.
- Brown, V.A., Harris, J.A., & Russell, J.Y. (eds) (2010). *Tackling Wicked Problems: Through the Transdisciplinary Imagination*. London: Earthscan. (Download through Purdue Libraries)
- Constable, G. (2014). *Talking to Humans: Success starts with understanding your customers*. Free pdf: http://www.talkingtohumans.com
- Crismond, D. and Adams, R.S. (2012). "The Informed Design Teaching and Learning Matrix". *Journal of Engineering Education*, 101(4), pp. 738-797.
- Davis, D. (2016). *Project Design Reviews*. Verity Design Learning.
- Davis, D. (2016). *Professional Teamwork Mentor: Resources for Achieving and Documenting Exceptional Teamwork.* Verity Design Learning.

- Frishberg, L. & Lambdin, C. (2016). *Presumptive Design: Design Provocations for Innovation*. London: Elsevier Press.
- Frodeman, R., Thompson Klein, J. & Mitcham, C. (eds) (2012). *The Oxford Handbook of Interdisciplinarity* (Chapter 10). London: Oxford University Press. (Available through Purdue Libraries)
- Kolko, J. (2015). *Exposing the Magic of Design: A Practitioner's Guide to the Theory and Methods of Synthesis*. London: Oxford Press.
- Otto, K.N.& Wood, K.L. (2001). *Product design: Techniques in reverse engineering and new product development*. New Jersey: Prentice Hall.
- Pahl, G. & Beitz, W. (2007) *Engineering Design: A Systematic Approach*, 3rd ed. Springer.
- Pendleton-Jullian, A. & Seely Brown, J. (2016). *Pragmatic Imagination: Single from Design Unbound*.
- Project Management Institute (2008) *A Guide to the Project Management Body of Knowledge, Fourth Edition (PMBOK)*. Upper Darby, PA: Project Management Institute (http://www.pmi.org).
- Repko, A.F. (2014). *Introduction to Interdisciplinary Studies*. Los Angeles: Sage Publications.
- Vassallo, S. (2015). *The Way to Design*. Free pdf: https://thewaytodesign.com
- Waloszek, G. (2012). Introduction to Design Thinking (IDEO). https://experience.sap.com/skillup/introduction-to-design-thinking/