Semester-level Outcomes	Lesson-level Outcomes
1- Identify, breakdown, and define open-ended problem(s).	1. Infer potential problem solving opportunities and generate an ongoing list.
	2. Verbalize, review and refine the problem statement to reflect the design intent and project direction.
	3. Define a system by its inputs, outputs, and key functions.
2- Research the context and background of problems and solutions, including user needs and technical requirements, through scholarly and authoritative sources, and stakeholder input.	1. Use scholarly and authoritative resources for literature research of the project.
	2. Use interviews with Subject Matter Experts (SMEs) and other stakeholders of the project as basis to understand background of the problem.
	3. Identify and prioritize technical requirements of the project.
	4. Identify stakeholders and analyze their relevance to the problem.
	5. Analyze the problem from a user's and stakeholders' perspective.
3 - Design solutions through cycle of testing, refining, iterating, and feedback.	1. Refine design/solution ideas through qualitative and quantitative justification with respect to requirements, constraints, novelty, and user/stakeholder needs.
	2. Create visual, mock-up prototypes of design options to provide a concrete representation.
	3. Build proof-of-concept prototypes based on a selected design option to provide demonstrable representations of key functional aspects of interfaced subsystems.
	4. Analyze and create iterations of the design through testing and refining prototypes.
	5. Prove prototype workability directly through testings or proxied through calculations, comparing and contrasting analogies, and/or expert testimonials.
	6. Create safe testing procedures, hypothesize outcome of testing, and explain testing results, specifically on how it will inform design improvement.
4 - Determine equivalency and equitably contribute to team efforts from start to end on a collaborative project, and participate in learning activities and coaching activities in the team.	1. Identify and agree on work equivalency among teammates and contribute equally to all of the team's efforts throughout the design process.
	2. Recognize individual strengths, utilize these skills, and coach other teammates.
	3. Recognize individual weaknesses, set goals for improvement, and learn from other teammates.
	4. Provide and receive feedback to/from peers and the instructor in a meaningful and professional way.
	5. Use team contract as guide for working together and overall code of conduct.
5 - Apply common workplace practices, tools and software in a semester long team project, including: project planning tools, team management tools, tools to generate and focus solution alternatives, decision analysis methods, risk analysis methods, and value proposition analysis / baseline comparison.	1. Break down a project into tasks and create a dynamic, shared, and continuously updated basic project schedule / Gantt chart.
	2. Team members shall generate a mutually agreed upon working contract that addresses team conduct and expectations for the duration of the semester project.
	3. Apply idea-generation techniques to create a diverse pool of project solutions.
	4. Apply decision analysis techniques to select the best (most valued, feasible, viable, economic, sustainable) problem solution idea to pursue and develop.
	5. Estimate costs for materials, labor, maintenance, and implementation for a given volume of solution replications/order size.
	6. Perform a risk analysis of potential outcomes resulting from the solution as applied to the problem from the perspective of stakeholders in terms of estimated probability and severity of consequences, and develop and describe a corresponding risk mitigation plan.
6- Present technical ideas and solutions graphically, orally, written, and through prototype	1. Compile idea generation, stakeholder needs, and contextual information to create and deliver an oral/visual design proposal (pitch) presentation.

Semester-level Outcomes	Lesson-level Outcomes
	2. Compile solution information, test results and justifications, research, stakeholder needs, base case comparison, cost estimates, problem statement and how it is addressed to create and deliver an technical oral/visual trade show / conference-style poster presentation.
	3. Compile user and stakeholder considerations, problem and technical requirements, research and testing results, to verbally and visually communicate design ideas and justifications through technical writing, applying proper tone, voice, grammar, structure, and formatting per given standards.
7 - Visually depict ideas to teammates, supervisors, and stakeholders through the use of field sketching for the purposes of communication as well as idea development and development through iteration.	1. Apply one-point and two-point perspective to sketch partially and fully developed ideas and designs, depicting distance and depth.
	2. Sketch landscapes and backgrounds to provide context for ideas and designs.
	3. Sketch the human figure to provide the context of human interaction for ideas and designs.
	4. Sketch detail views as necessary to depict key idea and design details.
	5. Sketch processes and procedures and sequences using nodes and links and universal symbols.
8 - Model and communicate formalized design ideas through the use of standardized engineering graphics conventions as applied to engineering sketching and computer-aided design/solid modeling software.	1. Identify and apply the various line types used in engineering drawings.
	2. Relate a scaled drawing to actual size and read and produce drawings to scale.
	3. Create neat freehand sketches while adhering to convention and demonstrating the importance of proportions.
	4. Apply the principles of orthographic projection to construct two-dimensional multiview drawings.
	5. Apply the principles of isometric projection to create three-dimensional isometric pictorial drawings.
	6. Construct auxiliary views and determine when auxiliary views are appropriate.
	7. Depict the interior view of an object as a section view, and determine when section views are appropriate, and what type of section view is appropriate.
	8. Apply the conventions of dimensioning, threads, tolerancing, hole, and other notations as necessary to annotate an engineering drawing.
	9. Interpret engineering drawings by gleaning basic design information from a drawing.
	10. Use SolidWorks as a computer-aided solid modeling tool to produce an accurate virtual model representing a real or imagined object, applying tools and concepts such as fully-defined sketches, multiple contours, design intent, features, applied features, bodies, and assemblies.
	11. Use SolidWorks as a computer-aided drafting tool to produce two-dimensional orthographic multiviews, three-dimensional isometric pictorials, plus auxiliary and section views, with dimensions, fully-populated title blocks, and other notations as necessary from virtual solid models.
	12. Apply all of the above to communicate and document a final project design via a comprehensive set of working/production drawings.