ARIZONA STATE UNIVERSITY

GENERAL STUDIES COURSE PROPOSAL COVER FORM

Course information:

*Copy and paste **current** course information from Class Search/Course Catalog.*

Academic Unit: **The Design School** Department: **Industrial Design**

Subject: **IND** Number: **465** Title: Collaborative Design and Development II Units: 5

Is this a cross-listed course? Yes
If yes, please identify course(s): **MGT 465/GRA 465**

Is this a shared course? Yes If so, list all academic units offering this course: MGT/GRA

Course description:
Team-based product development course featuring applied projects. Open to senior students from business, engineering, design, and other disciplines.

Requested designation: Literacy and Critical Inquiry–L
*Note- a **separate** proposal is required for each designation requested*

Eligibility:

Permanent numbered courses must have completed the university's review and approval process.
For the rules governing approval of omnibus courses, contact Phyllis.Lucie@asu.edu or Lauren.Leo@asu.edu.

Submission deadlines dates are as follow:

For Fall 2015 Effective Date: October 9, 2014

For Spring 2016 Effective Date: March 19, 2015

Area(s) proposed course will serve:

A single course may be proposed for more than one core or awareness area. A course may satisfy a core area requirement and more than one awareness area requirements concurrently, but may not satisfy requirements in two core areas simultaneously, even if approved for those areas. With departmental consent, an approved General Studies course may be counted toward both the General Studies requirement and the major program of study.

Checklists for general studies designations:

Complete and attach the appropriate checklist

- Literacy and Critical Inquiry core courses (L)
- Mathematics core courses (MA)
- Computer/statistics/quantitative applications core courses (CS)
- Humanities, Arts and Design core courses (HU)
- Social-Behavioral Sciences core courses (SB)
- Natural Sciences core courses (SQ/SG)
- Cultural Diversity in the United States courses (C)
- Global Awareness courses (G)
- Historical Awareness courses (H)

A complete proposal should include:

- ☒ Signed General Studies Program Course Proposal Cover Form
- ☒ Criteria Checklist for the area
- ☒ Course Catalog description
- ☒ Course Syllabus
- ☐ Copy of Table of Contents from the textbook and list of required readings/books

Respectfully request that proposals are submitted electronically with all files compiled into one PDF. If necessary, a hard copy of the proposal will be accepted.

Contact information:

Name: Prasad Boradkar Phone: 5-8685

Mail code: 3505 E-mail: prasad.boradkar@asu.edu

Department Chair/Director approval: *(Required)*

Chair/Director name (Typed): Craig Barton Date: 2/9/15

ARIZONA STATE UNIVERSITY

Chair/Director (Signature): _____

Mandatory Review for L Designation for IND/GRA/MGT 465: Collaborative Design and Development II

Justification Document

Introduction to the Course:

Though the mandatory review (L designation) is only for IND465 right now, I am including some information about IND464 as well, because courses are connected sequentially, and together, they serve as the yearlong capstone project for the students. IND464 and IND465 are courses offered through ASU's InnovationSpace program. InnovationSpace is an entrepreneurial joint venture among the Design School, Ira A. Fulton School of Engineering, W.P. Carey School of Business and School of Sustainability. The goal of the program and the courses is to teach teams of transdisciplinary students the process of developing products that create market value while serving real societal needs and minimizing impacts on the environment.

IND464 and IND465 are courses that focus on teaching students how to design and develop new products, and they involve teams of senior level students from five disciplines. Each team has one student from industrial design, one from visual communication design, one from business, one from sustainability and one from engineering. We work in conjunction with external partners and sponsors in these classes. I am the lead instructor for the two courses and faculty members from the other disciplines work directly with the students from their disciplines. The class meets on Mondays and Wednesdays from 1:20pm to 4:30pm. On Mondays, the entire class meets as a group for lectures, presentations, group meetings, etc. while on Wednesdays, the students meet with their disciplinary professors (the engineering students meet with their engineering professor, while the design students meet with me, business students meet with their business professor and so on) from 1:20pm to 2:30pm and then work in teams in the studio.

IND464 is divided into four phases, and IND465 is divided into three phases. Please refer to the syllabus for details on the phases.

IND 464:
Phases 1 and 2 involve the type of research and analysis that is conducted before any product development begins. In Phase 1 students collect information and Phase 2, they analyze it and generate a research report. Though this research and analysis is conducted as a group, each team member has a specific responsibility. For example, the engineering students are required to research existing and emerging technologies that can solve the problem they are exploring while the business students analyze the market opportunities. In Phase 3, students do brainstorming and generate product ideas and in phase 4, they document, present all the work done over the semester.

IND 465:
In Phase 5, evaluate the three key ideas developed in Fall semester and select one product concept (design concept, brand concept, engineering prototype and business plan) for further development. They start writing a final Innovation Proposal for that one product. At this stage, they also do presentations to the faculty members as well as the sponsors about their progress on the projects. The faculty provide feedback to the students on the written materials submitted in Phase 5. In Phase 6, the teams finalize the design of the product, create additional materials and make modifications to the Innovation Proposal. The faculty review the materials one more time, make suggestions for improvements and in Phase 7, student teams put together final materials for end of the year presentations. This includes the final Innovation Proposal (a compilation of the written and visual materials from all members of the team), a brief product pitch, an executive summary explaining the product, posters that show images of the product, as well as prototypes.

Arizona State University Criteria Checklist for

LITERACY AND CRITICAL INQUIRY - [L]

Rationale and Objectives

Literacy is here defined broadly as communicative competence—that is, competence in written and oral discourse. **Critical inquiry** involves the gathering, interpretation, and evaluation of evidence. Any field of university study may require unique critical skills that have little to do with language in the usual sense (words), but the analysis of written and spoken evidence pervades university study and everyday life. Thus, the General Studies requirements assume that all undergraduates should develop the ability to reason critically and communicate using the medium of language.

The requirement in Literacy and Critical Inquiry presumes, first, that training in literacy and critical inquiry must be sustained beyond traditional First Year English in order to create a habitual skill in every student; and, second, that the skill levels become more advanced, as well as more secure, as the student learns challenging subject matter. Thus, two courses beyond First Year English are required in order for students to meet the Literacy and Critical Inquiry requirement.

Most lower-level [L] courses are devoted primarily to the further development of critical skills in reading, writing, listening, speaking, or analysis of discourse. Upper-division [L] courses generally are courses in a particular discipline into which writing and critical thinking have been fully integrated as means of learning the content and, in most cases, demonstrating that it has been learned.
Notes:

1. ENG 101, 107 or ENG 105 must be prerequisites
2. Honors theses, XXX 493 meet [L] requirements
3. The list of criteria that must be satisfied for designation as a Literacy and Critical Inquiry [L] course is presented on the following page. This list will help you determine whether the current version of your course meets all of these requirements. If you decide to apply, please attach a current syllabus, or handouts, or other documentation that will provide sufficient information for the General Studies Council to make an informed decision regarding the status of your proposal.

Revised April 2014

Proposer: Please complete the following section and attach appropriate documentation.

ASU - [L] CRITERIA

TO QUALIFY FOR **[L]** DESIGNATION,THE COURSE DESIGN MUST PLACE A MAJOR EMPHASIS ON COMPLETING CRITICAL DISCOURSE--**AS EVIDENCED BY THE FOLLOWING CRITERIA:**

YES	NO		Identify Documentation Submitted
☒	☐	**CRITERION 1:** At least 50 percent of the grade in the course should depend upon writing assignments (see Criterion 3). Group projects are acceptable only if each student gathers, interprets, and evaluates evidence, and prepares a summary report. *In-class essay exams may not be used for [L] designation.*	Syllabus

1. Please describe the assignments that are considered in the computation of course grades--and indicate the proportion of the final grade that is determined by each assignment.

2. **Also:**

Please **circle, underline, or otherwise mark** the information presented in the most recent course syllabus (or other material you have submitted) that verifies **this description** of the grading process--and label this information **"C-1".**

C-1

YES	NO		
☒	☐	**CRITERION 2:** The writing assignments should involve gathering, interpreting, and evaluating evidence. They should reflect critical inquiry, extending beyond opinion and/or reflection.	Coursebook

1. Please describe the way(s) in which this criterion is addressed in the course design.

2. **Also:**

Please **circle, underline,** or **otherwise mark** the information presented in the most recent course syllabus (or other material you have submitted) that verifies **this description** of the grading process--and label this information **"C-2".**

C-2

YES	NO		
☒	☐	**CRITERION 3:** The syllabus should include a minimum of two writing and/or speaking assignments that are substantial in depth, quality, and quantity. Substantial writing assignments entail sustained in-depth engagement with the material. Examples include research papers, reports, articles, essays, or speeches that reflect critical inquiry and evaluation. Assignments such as brief reaction papers, opinion pieces, reflections, discussion posts, and impromptu presentations are not considered substantial writing/speaking assignments.	Coursebook

1. Please provide relatively detailed descriptions of two or more substantial writing or speaking tasks that are included in the course requirements

2. **Also:**

Please **circle, underline,** or **otherwise mark** the information presented in the most recent course syllabus (or other material you have submitted) that verifies **this description** of the grading process--and label this information **"C-3".**

C-3

ASU - [L] CRITERIA

YES	NO		Identify Documentation Submitted
☒	☐	**CRITERION 4:** These substantial writing or speaking assignments should be arranged so that the students will get timely feedback from the instructor on each assignment in time to help them do better on subsequent assignments. *Intervention at earlier stages in the writing process is especially welcomed.*	Coursebook

1. Please describe the sequence of course assignments--and the nature of the feedback the current (or most recent) course instructor provides to help students do better on subsequent assignments

2. **Also:**

Please **circle, underline,** or **otherwise mark** the information presented in the most recent course syllabus (or other material you have submitted) that verifies **this description** of the grading process--and label this information **"C-4".**

C-4

Course Prefix	Number	Title	General Studies Designation
IND	465	Collaborative Design and Development II	L

Explain in detail which student activities correspond to the specific designation criteria.
Please use the following organizer to explain how the criteria are being met.

Criteria (from checksheet)	How course meets spirit (contextualize specific examples in next column)	Please provide detailed evidence of how course meets criteria (i.e., where in syllabus)
1	These assignments address Criterion 1. As the Syllabus indicates, the course relies on students being able to do thorough research and analysis, write reports, and make public presentations. The end of the semester presentations are public events where the sponsors, an invited jury of designers, other university professionals, as well as faculty and students from the five disciplines are present. The students are aware of this and they prepare their presentation materials accordingly.	The students receive an individual grade (50%) as well as a team grade (50%) for the class. As demonstrated in the syllabus in the highlighted areas, research, analysis, report writing, and oral+visual presentations are critical activities that the students are expected to engage in alone as well as in teams. As highlighted in the syllabus, a total of 180 out of 300 points of the semester (60%) depend upon analysis, writing and presentation.
2	These assignments address Criterion 2. The Coursebook includes a list of all the critical analysis activities that the students have to perform through the semester. Students conduct research on their own and also in teams. This includes literature reviews as well as interviews with experts and users. They are required to analyze the data, generate insights, and write reports that explain their findings as well as design solutions.	As this course is the second half of the capstone class for seniors, it is a follow up on IND/GRA/MGT 464 from Fall semster. The design process that the students have to follow is divided into phases. Phases 1, 2, 3 and 4 happen in Fall, and Phases 5, 6 and 7 happen in Spring. Phases 5, 6, and 7 include the following: Phase 5 (Developing the Concept) Activities: Concept Development Develop evaluation criteria, conduct a thorough analysis of three concepts from Fall Semester, and generate a product evaluation matrix. Look up books, journal articles, and websites on topics relevant to the project at hand. Create a list of functions for the product service system to be used for biomimicry. Digest research reports from sponsors when available Develop a project plan Carefully evaluate, individually and as a team, what the solution needs to address from all the disciplines. Develop a design language Conduct additional research to revist and confirm user needs discovered during Fall semester. Create binders with all relevant research information Start generating materials for the first draft of the Innovation Proposal which includes the proposed

		business model, technical report, design process and sustainability report (this is done individually by the students and reviewed by the team). Make an oral and visual presentation (Powerpoint) of the project as a team to faculty members and invited guests as well as sponsors. Phase 6 (Finalizing the Concept) Activities: Concept Finalization Evaluate and finalize specifications for the final product service solution. Incorporate faculty and sponsor feedback from Phase 5 Analyze environmental and social considerations and start developing a sustainability strategy. Start reading and evaluating biological literature that can inspire solutions for design, business, engineering and sustainability. Evaluate all points of interaction between the product and the human (body and mind) and create the human interaction document Gather content for the second draft of the Innovation Proposal which includes an update on the business model, technical report, design process, and sustainability report. Make an oral presentation (Powerpoint) of the project as a team to faculty members and invited guests as well as sponsors. Phase 7 (Documentation, Presentation, Exhibition) Activities: Final Documentation Incorporate faculty and sponsor feedback from Phase 6. Write and design the final Innovation Proposal with the appropriate finalized sections on business, design, engineering and sustainability. Apply at least two biological principles to the concept from the perspectives of design, business, engineering and sustainability. Add to and complete individual disciplinary project reports Create an oral and visual presentation (Powerpoint and movie) Develop content for and create the Final Exhibition for the end of the semester. Create posters that explain design, business, sustainability and engineering aspects of the concept. Create models and prototypes for project
3	These assignments address Criterion 3: 1. A written document called the Innovation Proposal that is developed over the semester. 2. Four presentations, one at the beginning of the semester and three at the end of the three phases of the class (Phases 5, 6 and 7). As this is a year-long capstone project, Phases 1 through 4 occur during Fall	The Innovation Proposal is a document that requires each team member to write specific sections that relate to their contribution to the project. In addition to this written document, the teams present their progress to the faculty and sponsors as well as invited guests at the beginning of the class and at the end of each phase; making a total of four presentations over the semester. This list below shows both the written work as well as presentations that the students do (individually and as a team) over the three phases of the semester. Phase 5 (Developing the Concept) Activities:

	Semester.	The oveall goal for Phase 5 in the context of this criterion is the writing of the first draft of the Innovation Proposal. This includes the following materials: Write the first draft of the product-service system pitch Write summaries of the research finding and user needs Develop a design language in verbal and visual form. Write an analysis of competitors' products from a design perspective. Write a summary of the additional user research conducted and create a list of user needs. Write an analysis of the sustainability performance of competitors' products. Write the first draft of the Innovation Proposal which the proposed business model, technical report, design process and sustainability report (this is done individually by the students and reviewed by the team). Make an oral and visual presentation (Powerpoint) of the project as a team to faculty members and invited guests as well as sponsors. Phase 6 (Finalizing the Concept) Activities: Concept Finalization Finalize and write specifications of product Make edits to Phase 5 materials based upon faculty and sponsor feedback from Phase 5 Create the human interaction document Create biologically inspired solutions from the perspective of each discipline. Write the second draft of the Innovation Proposal which includes an update on the business model, technical report, design process, and sustainability report. Make an oral presentation (Powerpoint) of the project as a team to faculty members and invited guests as well as sponsors. Phase 7 (Documentation, Presentation, Exhibition) Activities Final Documentation Write and design the final Innovation Proposal with the appropriate finalized sections on business, design, engineering and sustainability. Select two examples of biomimcry from each discipline and write them up. Add to and complete individual disciplinary project reports (technical report, sustainability report, business report, design process). Create an oral and visual presentation (Powerpoint and movie) Finalize product-service system pitch Create the Final Exhibition Create posters that explain design, business, and engineering Create models and prototypes for project

4		Each phase of the class is kicked off with a Phase Lecture, Phase Assignment and a list of Phase Deliverables. Please see the Syllabus and Coursebook for details. Written feedback is given to the individual students and the teams during and at the end of each Phase. They are required to incorporate the feedback from the faculty into the work. They are also given 7 calendar days to improve upon the assignment based upon feedback given. This class has a Teaching Assistant who also sits down with each team individually to explain the reasons for the grades and what they can do to improve. The Innovation Proposal is built gradually through the semester because new components are added in each phase and students are given the opportunity of incorporating feedback throughout . Therefore there are three opportunities for students to get feedback and improve on their content as well as quality of writing. We also videotape one of the presentations during the semester so that we may share it with our sponsors. The students watch these presentations with the Teaching Assistant so that they may improve their oral skills.

INNOVATIONSPACE

SPRING 2015 SYLLABUS

IND/GRA/MGT 465

COLLABORATIVE DESIGN & DEVELOPMENT II

WELCOME BACK TO **INNOVATION**SPACE 2014-2015

IND/GRA/MGT 465: Collaborative Design & Development II

InnovationSpace is an entrepreneurial joint venture among the Herberger Institute for Design and the Arts, Ira A. Fulton Schools of Engineering, W.P. Carey School of Business and the School of Sustainability at Arizona State University. The goal of our transdisciplinary education and research lab is to teach students how to develop products that create market value while serving real societal needs and minimizing impacts on the environment. Put simply, we seek to create products and services that are progressive, possible and profitable. At the same time, they must have a meaningful impact on the everyday lives of people.

You're in a place where inquiring minds collaborate to create a more livable and sustainable world.

SYLLABUS – Spring 2015

CLASS INFORMATION

Meeting Times
MW Sessions: 1:20pm to 4:30pm in CDN 071 and CDN 269

This course builds on work completed during the preceding fall semester. It provides an opportunity for teams of senior-level students to complete a significant project while also potentially contributing to a better future. It does so by challenging students to work together to create comprehensive proposals around a new "product service system" design concept that addresses meaningful social and environmental challenges.

The class meets for 6 hours a week. On an average, we will spend 4 hours a week focused on general topics dealing with innovation, sustainability, biomimicry, etc. and 2 hours a week on topics of significance to your individual disciplines.

With the work completed during the fall semester as a foundation, each team will develop a comprehensive and detailed proposal structured around a specific product design concept. Each team will exhibit and present its Innovation Proposal at the end of the semester. Each team's proposal will describe how its product design concept is:

- Valuable (from a consumer's perspective)
- Possible (from a technological perspective)
- Desirable (from a market perspective)
- Good (from a social and environmental perspective)

Although the course is primarily project-based, it includes readings, presentations by both faculty and students, class discussions and an exhibition/presentation of each team's Innovation Proposal. Note: This spring semester course is a continuation of a two-semester class, that builds upon the work done during the fall semester.

COURSE OBJECTIVES

This course has been designed to achieve the following objectives:

1. To provide an opportunity for students and faculty to make a positive contribution to a better future
2. To help students understand the transdisciplinary process of developing new product-service systems that bring value to people, are desirable to industry, are possible through engineering and good for society and the environment
3. To establish an educational experience for students from business, design, sustainability and engineering that reflects real-life processes in the workplace
4. To understand and incorporate principles of biomimicry into the process of new product development
5. To assist university researchers and other groups in learning how to transfer socially progressive ideas and product concepts to the market
6. To assist corporations with design exploration to support their research and development efforts
7. To help students learn how to take product concepts from idea to market

GOALS

At the conclusion of this course, students will:
1. Understand Integrated Innovation and how it can be applied to create progressive proposals that incorporate insights from design, business, sustainability and engineering
2. Acquire valuable experience in cross-functional teamwork
3. Learn how to develop and persuasively communicate product proposals
4. Appreciate how design, business, sustainability and engineering can contribute to improvements for society and the environment
5. Learn about the principles of biomimicry

STRUCTURE AND DELIVERABLES

This course build upon the work done in Fall semeter, includes three phases and has specific deliverables due at the end of each phase.

Phase 5 – Developing the Concept
This phase entails evaluating all concepts and selecting one, making all critical decisions and resolving all issues relating to the proposed product design concept, functional prototype, brand strategy, business model and a sustainability strategy.

Phase 6 – Finalizing the Concept
This phase entails developing final specifications and producing physical materials to communicate all aspects of the project (e.g., the product design concept, functional prototype, manufacturing plan, brand strategy, business model and sustainability strategy).

Phase 7 – Innovation Proposal, Exhibition and Presentation
This phase involves the development of materials (text-based, visual, physical and presentational) that document the innovation that each team has developed to a public audience.

EXPECTATIONS

Expectations of Students
1. Energy, commitment and motivation to learn, excel and accomplish
2. Dedication to the project (i.e., the opportunity to contribute to a better future)
3. Respect for one another and the value each team member brings to the project
4. Self-motivation, self-discipline and a desire to exceed expectations
5. Willingness to help others and to seek help when required

Expectations of the Faculty Team
1. Articulate a clear vision for the course, maintain a reasonable schedule and define a set of appropriate deliverables
2. Be available during scheduled class and during office hours (or by appointment)
3. Evaluate work and student performance/work fairly and consistently
4. Provide honest, direct feedback and help when required
5. Challenge all students to achieve the highest level of performance possible

POLICIES

Attendance
Attendance is required for all meetings, lectures, discussions, presentations and teamwork sessions. Three absences result in a warning. Additional absences will result in the lowering of the final grade by one full grade point (e.g., an "A" will be reduced to a "B").

Reading Assignments
In addition to honing your design, business and engineering skills, one of the other goals of this course is to provide you with some knowledge of other disciplines as well. This will happen informally as you work in your teams on the project, and in addition, you will have assigned readings relevant to the topics relevant to the class and your individual disciplines.

Late Deliverables
Deliverables are due at the beginning of class on the date specified on each assignment sheet. Late deliverables will be accepted at the beginning of the next scheduled class session but will not, under any circumstances, receive a grade higher than a "C."

Withdrawals
Consistent with ASU policy, withdrawals will be handled as per the following guidelines:

Withdrawal before the end of the fourth week:
A "W" will be recorded

Withdrawal after the end of the fourth week:
A "W" will be recorded if you have a passing grade at the time of withdrawal
An "E" will be recorded if you have a failing grade at the time of withdrawal

GRADING

Grades will be determined based on the following categories and points. Each student will be provided with a written evaluation at the end of each phase of the project.

Phase Grades
The total points for the class will be 300, with each phase (5, 6 and 7) worth 100 points each. The overall grade for the semester will be calculated on the basis of team performance and individual performance.

C-1

Team Performance (150 points – 50 points for each phase)
This specifically pertains to the quality of everything your team produces and presents. This includes: the management of the project and the team; the creativity, depth and robustness of your team's work and the effectiveness of your presentations and other deliverables (i.e., physical and print-based). This relates directly to the team's willingness to prompt and facilitate a constructive experience for all members. This may be demonstrated by your willingness to create social cohesiveness, help other team members and (very important) actively seek ways to resolve any team conflicts. Constructive action in resolving conflicts includes contacting the instructors to seek advice, help or intervention.

Note: team conflicts are not necessarily a problem; allowing conflicts to progress unchecked, however, is a problem. Teams and/or individuals will be penalized if they do not take action to resolve team problems or conflicts.

C-1

Individual Performance (150 points – 50 points for each phase)
In addition to your team's performance, you will be evaluated based on your individual performance. This will be measured by comparing what you commit to accomplish at the beginning of each phase (as evidenced in the Plan each team will prepare), and what you actually produce at the end of each phase (as evidenced by the physical and print-based materials you hand in and your participation and contribution to the public presentations).

A more detailed grading breakdown will be presented with the phase descriptions.

Phase 5 = 100 points
Phase 6 = 100 points
Phase 7 = 100 points

Grading Scale and Meaning
A = consistently excellent, honors quality performance and work. 90 to 100 points.
A+ is 100-96.7, A is 96.6-93.4, A- is 93.3-90
B = above average performance and work. 80 to 90 points.
B+ is 89.9-86.7, B is 86.6-83.4, B- is 83.3-80
C = average performance and work. 70 to 80 points.
C+ is 79.9-76.7, C is 76.6-70
D = below average performance and work. 60 to 70 points.
E = unacceptable performance and work. Below 60 points.

ACADEMIC HONESTY

All necessary and appropriate sanctions will be issued to all parties involved with plagiarizing any and all course work. Plagiarism and any other form of academic dishonesty that is in violation with the Student Code of Conduct will not be tolerated. For more information, please see the ASU Student Academic Integrity Policy: http://www.asu.edu/studentaffairs/studentlife/judicial/academic_integrity.htm

SPECIAL ACCOMMODATIONS

To request academic accommodations due to a disability, please contact the ASU Disability Resource Center (http://www.asu.edu/studentaffairs/ed/drc/# <http://www.asu.edu/studentaffairs/ed/drc/> ; Phone: (480) 965-1234; TDD: (480) 965-9000). This is a very important step as accommodations may be difficult to make retroactively. If you have a letter from their office indicating that you have a disability which requires academic accommodations, in order to assure that you receive your accommodations in a timely manner, please present this documentation to me no later than the end of the first week of the semester so that your needs can be addressed effectively.

INSTRUCTOR INFORMATION

The InnovationSpace faculty team encourages students to consult regularly with us outside of class. Take advantage of our offer!

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Susan Spierre Clark (Sustainability)
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INNOVATIONSPACE

INNOVATIONSPACE

Spring 2015

COURSEBOOK

This coursebook details your assignments and deliverables for each phase of the class.

SPRING 2015 SCHEDULE

This schedule gives you an hour-by-hour glimpse at the class activities over the semester. The text in blue refers to lectures and activities for all disciplines. Disciplinary breakout sessions will be on Wednesdays. As you can see below, Business is cyan, Engineering is magenta, I.D. is yellow , Sustainability is violet and V.C.D. is green.

Week	Day	Discipline	1:20 - 2:30	2:20 - 3:30	3:30 - 4:30
1	M Jan 12	All disciplines Business Engineering I.D. Sustainability V.C.D.	Introduction to Spring Semester Phase 5 Kick-off CDN 071	Preparation for Wednesday Presentation CDN 269	
	W Jan 14	All disciplines Business Engineering I.D. Sustainability V.C.D.	Presentations by Student Teams CDN 071 **C-3**		
2	M Jan 19	All disciplines Business Engineering I.D. Sustainability V.C.D.	Martin Luther King Jr. Day, No Class		
	W Jan 21	All disciplines Business Engineering I.D. Sustainability V.C.D.	Concept Evaluation in Studio CDN 269		
3	M Jan 26	All disciplines Business Engineering I.D. Sustainability V.C.D.	Discussion of Phase 05 (by Prasad) Presentation on Product Safety (by David Frakes) CDN 071	Studio Time CDN 269	
	W Jan 28	All disciplines Business Engineering I.D. Sustainability V.C.D.	Presentation on Biomimicry (by Elizabeth Cash & Heidi Fischer) CDN 071	Studio Time CDN 269	
4	M Feb 02	All disciplines Business Engineering I.D. Sustainability V.C.D.	Presentation on Comprehensive Innovation Strategy (by Prasad)	Studio Time CDN 269	

Week	Day	Discipline	1:20 - 2:30	2:20 - 3:30	3:30 - 4:30
	W Feb 04	All disciplines Business Engineering I.D. Sustainability V.C.D.	Breakout Sessions Business meeting CDN 075 Engineering meeting CDN 071 I.D. meeting CDS 126 Sustainability meeting CDS 127 V.C.D. meeting Studio	Studio time CDN 269	
5	M Feb 09	All disciplines Business Engineering I.D. Sustainability V.C.D.	Presentation on Biomimicry (by Elizabeth Cash & Heidi Fischer) CDN 071	Studio Time CDN 269	
	W Feb 11	All disciplines Business Engineering I.D. Sustainability V.C.D.	Breakout Sessions Business meeting CDN 075 Engineering meeting CDN 071 I.D. meeting CDS 126 Sustainability meeting CDS 127 V.C.D. meeting Studio	Studio Time CDN 269	
6	M Feb 16	All disciplines Business Engineering I.D. Sustainability V.C.D.	Presentation on Biomimicry (by Elizabeth Cash & Heidi Fischer) CDN 071	Studio Time CDN 269	
	W Feb 18	All disciplines Business Engineering I.D. Sustainability V.C.D.	Breakout Sessions Business meeting CDN 075 Engineering meeting CDN 071 I.D. meeting CDS 126 Sustainability meeting CDS 127 V.C.D. meeting Studio	Studio Time CDN 269	
7	M Feb 23	All disciplines Business Engineering I.D. Sustainability V.C.D.	Phase 05 Deliverables Due Presentations by Students in Class **C-3**		
	W Feb 25	All disciplines Business Engineering I.D. Sustainability V.C.D.	Breakout Sessions Business meeting CDN 075 Engineering meeting CDN 071 I.D. meeting CDS 126 Sustainability meeting CDS 127 V.C.D. meeting Studio	Studio Time CDN 269	
8	M Mar 02	All disciplines Business Engineering I.D. Sustainability V.C.D.	Presentation on Lifecycle Assessment (by Susan Clarke) CDN 071	Studio Time CDN 269 Biomimicry team meetings	

Week	Day	Discipline	1:20 - 2:30	2:20 - 3:30	3:30 - 4:30
	W Mar 04	All disciplines Business Engineering I.D. Sustainability V.C.D.	Breakout Sessions Business meeting CDN 075 Engineering meeting CDN 071 I.D. meeting CDS 126 Sustainability meeting CDS 127 V.C.D. meeting Studio	Studio time CDN 269 Biomimicry team meetings	
9	M Mar 09	All disciplines Business Engineering I.D. Sustainability V.C.D.	Spring Break No Class		
	W Mar 11	All disciplines Business Engineering I.D. Sustainability V.C.D.	Spring Break No Class		
	M Mar 16	All disciplines Business Engineering I.D. Sustainability V.C.D.	Presentation on Branding (by Craig Hedges) CDN 071	Studio Time CDN 269	
	W Mar 18	All disciplines Business Engineering I.D. Sustainability V.C.D.	Breakout Sessions Business meeting CDN 075 Engineering meeting CDN 071 I.D. meeting CDS 126 Sustainability meeting CDS 127 V.C.D. meeting Studio	Studio Time CDN 269	
10	M Mar 23	All disciplines Business Engineering I.D. Sustainability V.C.D.	Presentation on Sustainability (by Christopher Boone) CDN 071	Studio Time CDN 269	
	W Mar 25	All disciplines Business Engineering I.D. Sustainability V.C.D.	Breakout Sessions Business meeting CDN 075 Engineering meeting CDN 071 I.D. meeting CDS 126 Sustainability meeting CDS 127 V.C.D. meeting Studio	Studio Time CDN 269	
11	M Mar 30	All disciplines Business Engineering I.D. Sustainability V.C.D.	Studio Time CDN 269		

Week	Day	Discipline	1:20 - 2:30	2:20 - 3:30	3:30 - 4:30
	W Apr 01	All disciplines Business Engineering I.D. Sustainability V.C.D.	Phase 06 Deliverables Due Presentations by Students in Class **C-3**		
12	M Apr 06	All disciplines Business Engineering I.D. Sustainability V.C.D.	Presentation on How to Start a New Venture (by Sidnee Peck) CDN 071	Studio Time CDN 269	
	W Apr 08	All disciplines Business Engineering I.D. Sustainability V.C.D.	Breakout Sessions Business meeting CDN 075 Engineering meeting CDN 071 I.D. meeting CDS 126 Sustainability meeting CDS 127 V.C.D. meeting Studio	Studio time CDN 269	
13	M Apr 13	All disciplines Business Engineering I.D. Sustainability V.C.D.	Presentation on Freelance Consulting (by Scott Reeves) CDN 071	Studio time CDN 269 Biomimicry team meetings	
	W Apr 15	All disciplines Business Engineering I.D. Sustainability V.C.D.	Breakout Sessions Business meeting CDN 075 Engineering meeting CDN 071 I.D. meeting CDS 126 Sustainability meeting CDS 127 V.C.D. meeting Studio	Studio Time CDN 269 Biomimicry team meetings	
14	M Apr 20	All disciplines Business Engineering I.D. Sustainability V.C.D.	Presentation on Supply Chain Management (by Sidnee Peck) CDN 071	Studio Time CDN 269	
	W Apr 22	All disciplines Business Engineering I.D. Sustainability V.C.D.	Breakout Sessions Business meeting CDN 075 Engineering meeting CDN 071 I.D. meeting CDS 126 Sustainability meeting CDS 127 V.C.D. meeting Studio	Studio Time CDN 269	
15	M Apr 27	All disciplines Business Engineering I.D. Sustainability V.C.D.	Semester End Presentation (by Prasad) CDN 071	Studio Time CDN 269	

Week	Day	Discipline	1:20 - 2:30	2:20 - 3:30	3:30 - 4:30
	W Apr 29	All disciplines Business Engineering I.D. Sustainability V.C.D.	Studio Time CDN 269		
16	M May 04	All disciplines Business Engineering I.D. Sustainability V.C.D.	Phase 07 Deliverables Due Presentation by Students in Class **C-3**		
	W May 06	All disciplines Business Engineering I.D. Sustainability V.C.D.	Reading Day, No Class		
17	F May 08	All disciplines Business Engineering I.D. Sustainability V.C.D.	Presentation to Jury 4:00pm to 5:30pm InnovationSpace Show 6:00pm to 8:00pm The Ice House, Phoenix, AZ **C-3**		

A COMPREHENSIVE INNOVATION STRATEGY

For this semester, you will organize your deliverables on the basis of a comprehensive innovation strategy as described in the next few pages.

A COMPREHENSIVE INNOVATION STRATEGY

GOALS

For an organization to be truly innovative and design driven, it has to consider its internal capabilities as well as external pressures; it has to think about innovation in its offerings (products and services), but also in how it operates as an organization (internal processes). This framework of innovation includes some of the key parameters that should be considered in developing a comprehensive innovation strategy. There are several areas within an organization where structural changes can be introduced and the following list shows some of them:

1. Product Innovation
2. Service Innovation
3. Brand Experience Innovation
4. Business Model Innovation
5. Innovation through Sustainability
6. Internal Process Innovation

1. Product Innovation

Product manufacturers (like Apple, Nike, Samsung, Whirlpool and others) who market tangible consumer goods (like phones, shoes, refrigerators and washing machines) often tend to focus on this as their primary target of innovation. Product innovation can be organized around the following areas:

- Form and Aesthetics
- Performance
- Price
- Material use
- Technology
- Safety
- Ergonomics and human factors
- Packaging
- Platforms

2. Service Innovation

Providers of services (car repair shops, package delivery services, DVD rentals, etc.) may not create tangible goods, but often produce a series of intangible outcomes. People often need a series of services when interacting with the material world. Making these more innovative involves driving innovation into the entire consumer experience. This involves the following steps.

- Pre-sales knowledge about offerings to consumers
- In-store/online service
- Post-sale service
- Maintenance and repair service
- End-of-life service (recycling, disposal)

3. Brand Experience Innovation

Each institution/product/service/individual can be said to have a brand. Essentially, a brand can be defined as the general impression in the consumer's mind of a product or service, which is structured around a series of touch points. Brand experience innovation involves the development of a series of new or improved touch points for a better overall consumer experience. The consumer relates to the brand and structures his or her experience of the brand on the basis of these touch points listed below.

- Logo
- Advertising
- Social media
- Sales channels
- Distribution channels
- Retail environment
- Signage
- Website
- Packaging
- Graphics
- Tagline and other verbal information

4. Business Model Innovation

A business model defines the way an enterprise operates, generates revenue, manages partnerships, and designs future strategy. The development of a new business model can drastically change the way an institution behaves, and here are some of its components.

- Financial model
    - Product cost reduction
    - Pricing models
    - Sales strategy
    - Sales channels
    - Retail strategy
- Supply chain
    - Local supplier network
    - Global supplier network
    - Vendor education
- Marketing and advertising
- Sales Model
- Resource model
    - Human resources
    - Infrastructural resources
    - Utility resources
    - Financial resources
- Partnerships
    - Unexpected partners
    - Corporate partners, individual consumers, universities, non-profit companies

5. Innovation through Sustainability

An emphasis on sustainability, defined in economic, social and environmental terms as outlined by John Elkington can also be a driver for innovation. Making the organization environmentally responsible at all levels involves the examination of the following issues.

- Lifecycle assessment of products
- Material selection for products
- Material use in factory
- Energy use in factory
- Waste reduction in all facilities
- Lean manufacturing process
- Emissions reduction
- Fuel and cost reduction in transportation of supplies and finished goods
- End-of-life management of products (reject, reduce, reuse, repair, recycle)

Making the organization socially sustainable at all levels at all levels involves the examination of the following issues.

- Social innovation
- Corporate Social Responsibility code
- Labor practices
- Fair wage
- Factory conditions
- Safety characteristics
- Employee happiness
- Employee empowerment
- Charity programs
- Philanthropy

These components of sustainability, when examined in detail, can lead to a variety of new possibilities, from the use of innovative materials to the development of new business practices.

6. Internal Process Innovation

Institutions need to develop internally and focus on innovation at all levels within the organization to infuse all employees with an interest in and capacity for innovation. This involves the following areas.

- Developing a forward-looking corporate vision
    - Leadership with vision
    - Future-oriented growth strategy
    - Creative leadership
- Making the product design and manufacturing process more innovative
    - Managing comprehensive research
    - Leading by brainstorming
    - Engaging in in-depth ideation for all projects
    - Following through with thorough implementation
- Making the organizational culture more innovative
    - Offering employees a creative workspace
    - Giving employees the freedom to explore new ideas
    - Offering a visionary, creative and supportive leadership
    - Easy availability of tools to be innovative (knowledge of innovation processes)
    - Reward structures for innovative ideas
    - Professional development to learn new skills
- Making the employees more innovative
    - Reward system for creative thinking
    - Ownership in the vision of the enterprise
    - Loyalty to the vision

Phase 05
DEVELOPING THE CONCEPT

In this phase you will select one of the three concepts from last semester and start developing it in detail.

PHASE 5 - DEVELOPING THE CONCEPT

GOALS

The goals of this phase are to:

- Make critical decisions about your team's product design concept, engineering, brand strategy, sustainability strategy and marketing plan
- Establish a foundation for final specifications to be developed in Phase 06.

ASSIGNMENT

Explore and develop the following:

- All technical and functional issues relating to the selected product design concept
- Aesthetic direction for the product design concept
- Message and aesthetic direction for the brand identity design
- Scope and content of a business model
- Initial framing of a sustainability strategy

DELIVERABLES

This phase has the following deliverables.

Team Deliverables **Due: Monday, February 23**

- Product-Service System Pitch
- Research Update and List of User Needs
- Biomimicry Deliverables: List of Functions

Industrial Design Deliverables **Due: Monday, February 23**

- Product Appearance Benchmarking
- Design Language
- Sketch Packet

Sustainability Deliverables **Due: Monday, February 23**

- Systems Map
- Stakeholder Map
- Sustainability Benchmarking

Engineering Deliverables **Due: Monday, February 23**

- Planning Tree Diagram
- Gantt Chart
- Problem Understanding Form
- House of Quality
- Function Tree
- Morphological Chart
- Specification Sheet
- Technical Report Draft 01

Visual Communication Deliverables **Due: Monday, February 23**

- Innovation Proposal Draft 1
- Brand Benchmarking
- Brand Identity Design

Business Deliverables **Due: Monday, February 23**

- The Business Model
- The Business Model Canvas
- Listing and Testing Assumptions (Sections 1-6)
- Empathy Map and What If Questions

DELIVERABLES: TEAM

These deliverables have to be produced by all of you working together.

C-3

A Product-Service System Pitch

Now that you have selected one concept to move forward with, explain what the product-service system is in approximately 200 words. Write about the problem it addresses, its basic function, its key features and functions, its benefits to the user, and its unique properties that sets it apart from the competition.

C-2

Research Update and List of User Needs

You conducted research last semester to uncover user needs. Now that you have a specific problem that you are solving, you need to do some quick additional research with users to validate past research and uncover any new insights. Once you do this, make a comprehensive list of needs of all stakeholders of your product-service system. Think of the physiological, emotional, and cognitive needs of users, manufacturers, suppliers, retailers, purchasers, reviewers, etc. Also think of all the stages in the lifecycle of the product including raw material, transportation, manufacturing, lifetime use, and end of life. And finally, think from your disciplinary perspective of business, engineering, graphic design, sustainability and industrial design.

According to the Biomimicry Institute, "to use biomimicry as an innovation tool for design challenges, the challenge must first be simplified to what the design should do (i.e., its function). The function can then be biologized: "How would nature do X?"

Create a list of functions that your product-service system needs to achieve.
Use two strategies to make sure that you have a comprehensive list.

a. Life-cycle thinking: Think of the functions for the entire lifecycle of the product that include the stages of raw material, transportation, manufacture, use and disposal.
b. Disciplinary thinking: We want to look at the potential of biomimicry for product design, graphic design, business, sustainability as well as engineering. Therefore, also think of all the business, graphic, product, sustainability and technological functions of the product and generate a list of the necessary services, functions, and features of your product from your disciplinary perspective.

Generate at least 20 functions per discipline. The more you have, the easier it will be to find creative, biomimicry solutions.

DELIVERABLES: INDUSTRIAL DESIGN

The product designer and the engineer should work closely together to ensure proper aesthetic development of the product chosen.

C-2

Product Appearance Benchmarking - Competitors

Identify products (at least five but no more than ten) in today's marketplace that you consider to be competitors to your selected concept. Communicate the results of your analysis by creating a simple benchmarking chart/diagram and explanations of each product.

Analyze the appearance of all of the competitors based on the following criteria:

- Personality
- Form

- Materials and Textures
- Color
- Details

Design Language

Develop three variations of a specific, future-oriented Design Language. The three languages should be entirely different from each other.
This should include:

C-3

- A name that aptly describes the personality of the Design Language you're proposing (descriptive names are remembered; boring ones are forgotten).
- A written/visual description of your Design Language. Make certain to organize your description around the key elements of design, namely personality, form, materials and textures, color and details.
- A clear articulation of/rationale for why you think your Design Language is appropriate to the targeted user group.
- A moodboard/inspiration board. You may find images on such websites as Core77, endgadget, etc. or in such publications as ID magazine, Innovation, etc. of products that you think have attractive, contemporary forms.

Once you have three languages defined, pick one that you think makes best sense for the product/sponsor environment of use/user, and then work within that visual strategy for the rest of the semester.

Sketchbook and Sketch Packet

Based on your selected Design Language, begin exploring a wide variety of formal solutions, through thumbnail drawings as well as concept sketches. Consider conservative ideas, wild ideas, and everything in between (but make certain they all reflect your Design Language). Make sure to compose great pages of drawings with lots of ideas. Turn in 30 pages by the due date. Of these 30, at least 5 pages should have thumbnail exploratory sketches. Y

You will be given a separate assignment sheet for the sketchbook.

DELIVERABLES: SUSTAINABILITY

A Systems Map

C-2

You created a systems map last semester showing the flows of people, materials and energy between all the stakeholders and organizations involved in the production, distribution and consumption. Now that you have a narrower focus on a specific problem, revisit your earlier systems map and update it. Consider the major factors of economics, ecology, politics and culture. You will essentially be mapping the exchanges that occur from and to the biosphere, lithosphere, suppliers, customers, community, etc. Specify flow quantities (indicators) as well as the units, and link the flows to sustainability principles. Also indicate potential feedback options and recommend mechanism by which to close the material loops in the system.

Stakeholder Map

C-2

According to the organization Business for Social Responsibility (BSR), "stakeholder mapping is a collaborative process of research, debate, and discussion that draws from multiple perspectives to determine a key list of stakeholders across the entire stakeholder spectrum." BSR recommends four stages in the process of mapping:
1. Identify: Make a list relevant groups, organizations, and people
2. Analyze: Understand each stakeholder's perspectives and interests
3. Map: Create a visual map that shows the relationships to objectives and other stakeholders
4. Prioritize: Rank order the stakeholder relevance and identifying issues

Use the handout (BSR document on Stakeholder Identification and Mapping) that is posted on Blackboard for this assignment and create the maps shown on page 3.

Sustainability Benchmarking

C-2

The task here is to evaluate the products that your design will be competing with from the lens of sustainability. What is the social and environmental performance and impact of the competitors'' products? How well do they perform along sustainability metrics? Select three product systems from three of your competitors and evaluate them based upon social and environmental indicators. There are an extremely large number of sustainability metrics developed by several organizations (http://en.wikipedia.org/wiki/Sustainability_metrics_and_indices). You are welcome to use either one of these systems. You will discover that corporations are often unwilling to release information about the environmental performance of their products. Your job is to find as much information as you can about the three chosen product systems and put together your assessment.

C-3

DELIVERABLES: ENGINEERING

The engineer and the product designer should work closely together to ensure proper functional development of the final product-service system. This semester's engineering deliverables are based upon the book *Introductory Biomedical Design Tools* by Singhose, Donnell and Frakes.

Planning Tree Diagram

As you have now selected one concept to focus on, you will need to plan your activities for the semester. A Planning Tree diagram can help the engineer manage and schedule all the tasks she or he is required to perform on the project. As the overall task of design and prototyping can be overwhelming and somewhat vague in the beginning, it is helpful to decompose it into smaller tasks. A Project Manager generally distributes the tasks as appropriate to members of the design team. In your case, plan out all the engineering activities you are expected to perform for the semester. See the example on page 48 in the book.

Gantt Chart

While the Planning Tree Diagram decomposes the project into smaller tasks, it does not indicate a time schedule for when the tasks should be completed. A graph that includes a listing of tasks along with start and end dates is often called a Gantt Chart. This chart can show the schedule for the smallest level of task planning, or it can show the required activities grouped in larger tasks. Construct a Gantt Chart for this semester, based upon the example on page 49 in the book.

Problem Understanding Form

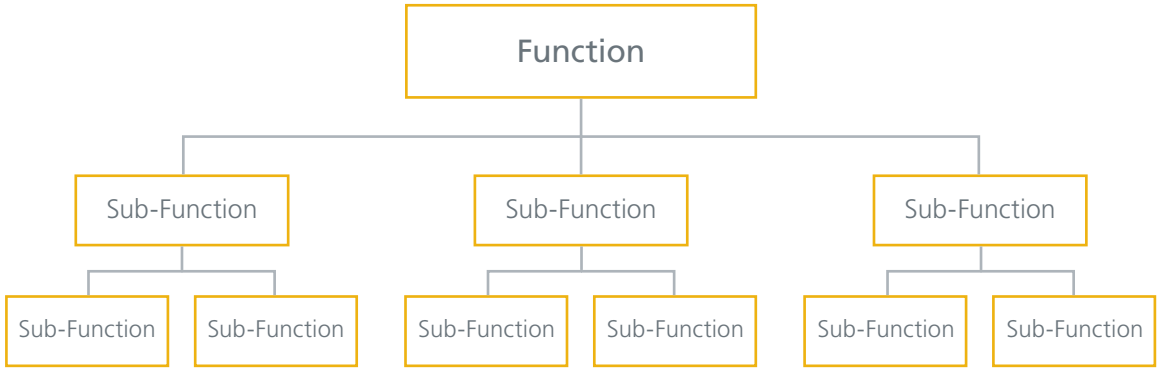
The Problem Understanding Form is a simple tool that can be used to relate customer needs to engineering requirements. This form contains three main parts. The first is a list of customer needs that can be obtained through ethnographic research and market data. The second part is a list of engineering requirements that will be used to design the product. And finally, the third part of the form is a matrix that maps the relation between the two (needs and requirements). The customer needs are listed vertically on the left and the engineering requirements are listed horizontally across the top. Symbols or numbers that indicate the degree of correlation between each need-requirement pair are then filled into the matrix. Construct a Problem Understanding Form for your product based upon the example on page 6.

House of Quality

Like the Problem Understanding Form explained above, the House of Quality is also a diagram that is used to map the relationship between customer needs and engineering targets. However, it builds upon and adds more detail to the Problem Understanding Form. Each customer need is now assigned an importance value. In addition, the House of Quality is also used to evaluate how well competitors meet the customer needs. The roof (the top) of the diagram contains a correlation matrix between the engineering requirements. When effort is directed at improving one of the engineering requirements, this often has a positive or negative, effect on other requirements. This helps engineers to prioritize the higher ranked over the less important ones. See page 7 for an example of a House of Quality diagram, and create one for your product.

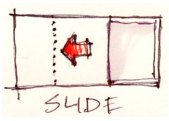
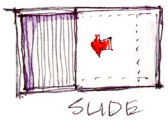
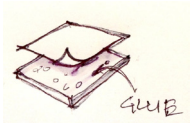
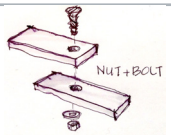
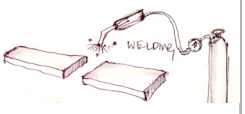
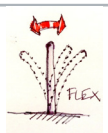
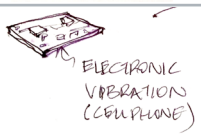
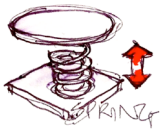
Function Tree

Every product has a primary function and a series of sub-functions that it is expected to achieve. In order to be able to design a system that is able to successfully achieve all functions and sub-functions as per specifications, it is useful to use a graphic tool called a Product Function Tree. This simple device allows engineers to break down a large problem into its components, making it easier to address each one individually. In the final solution, all sub-functions have to work in conjunction with each other seamlessly. This Product Function Tree can then be used to figure out the most appropriate mechanisms (mechanical, electronic, etc.) by which to achieve the functions and sub-functions. Please refer to pages 9-11 in the book.



Morphological Chart

A Morphological Chart is a graphic tool that helps engineers brainstorm a variety of possible solutions to achieve all the sub-functions listed in the Function Tree. This is created in the form of a table, which has the product sub-functions in the first column, followed graphical representations (sketches) of potential solutions for each sub-function in the second, third and subsequent columns. Once a large number of solutions have been placed in the Morphological Chart, they can be mixed and matched to create the final solution, and used to figure out the mechanical/electromechanical design for the entire product. It is advisable to generate a large number of alternative designs before finalizing the solution. Please refer to pages 21-22 in the book.

CHART	SOLUTION 1	SOLUTION 2	SOLUTION 3	SOLUTION 4
Open				
Close				
Attach				
Vibrate				

Specification Sheet

A Specification Sheet is a table that lists all the performance requirements that a product needs to achieve or exceed. Specifications are usually listed in the form of numbers and units. Maximum weight = 500 lbs. These numbers/numerical values are important because they serve as goals or targets to be achieved by design. The first column of the Specification Sheet table (see below) is the showing latest activity/update to the specifications. The second column is used to gauge the criticality of the specification, and lists whether the requirement is a Demand (D) or a Wish (W). Demands must be achieved, while wishes are goals that should be achieved if possible. And finally, the third column lists the specification itself in numerical terms. Please refer to pages 15-16 in the book.

Generally, a Product Specification Sheet includes the following categories:
Geometry, Kinematics, Forces, Energy, Materials, Maintenance, Safety, Ergonomics, Production, Quality Control, Assembly, Transport, Operation, Signals, Recycling, Cost and Schedule.

CHANGES	DEMAND OR WISH	REQUIREMENT	RESPONSIBILITY	SOURCE
Date		Geometry		
October 23, 2012	D	Total Length: 10" to 15"	David Frakes	Team
		Recycling		
	W	Total % of Recycled Content: 90-95		
	D	Total % of Recyclable Content: 100		

Technical Report, Draft 01

All the information that you have generated throughout the semester should be organized into an Engineering Report. Create the following chapters in this report, as explained on page 69 in the book.

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1. Abstract
2. Introduction
3. Design Overview
4. Discussion
5. Conclusions

DELIVERABLES: VISUAL COMMUNICATION DESIGN

The graphic designer and the business student should work closely together to ensure a proper fit between the marketing strategy and the brand design.

Innovation Proposal Draft 01

C-3

Create a layout for your Innovation Proposal right now and start inserting all the information in it. At the end of every phase, hand it in for feedback so that by the end of the semester, you will have a very well developed book. We will keep working on this document through the semester. In Phase 6, you will submit Draft 2, and the final printed version in Phase 7, at the end of the semester. The following list shows the content you will need for the book. Divide this document into these major components:

Introduction
- Table of contents
- Project team, sponsor, etc.
- The problem being solved
- Brief description of the product-service system with images
- User profiles

Product Innovation
Service Innovation
Brand Experience Innovation
Business Model Innovation
Innovation through Sustainability

More details for these sections will be provided later.

C-2

Brand Benchmarking - Competitors

Identify brands (at least five but no more than ten) in today's marketplace that you consider competitors to your brand. Communicate the results of your analysis by creating a simple benchmarking chart/diagram. Analyze the appearance of all of the competitors based on the following criteria:

- Personality/Character
- Form
- Materials And Textures
- Color
- Typographic Treatment

Brand Identity Design

The design elements of the brand include visual, verbal, positioning, and experiential elements based upon a newly developed design language. You may not design all of these elements below, but this is a checklist that you should look through to decide what you need to think about for the brand.

The verbal elements (set of meaningful terms) include the following:

- Brand Name
- Descriptor
- Positioning Tag Line (Created for the long run)

The visual elements (or other senses too) include:

- Logo

The positioning elements (tactical blueprints for identity in the marketplace) include:

C-2

- Audience Messaging Matrix (a table matching primary and secondary target audiences with features and benefits of the brand). Think of the best media mechanisms that you can use to get the word out about the benefits of your product. Remember, your audience reads and responds to specific magazines, television shows and methods of advertising. Keep those in mind, but also develop new and interesting techniques.

The matrix should include the following categories:

Audience/Stakeholder	**Message/Benefit**	**Channel**
65+ men	This product will help you to take your meds on time	AARP email blast; Leased from pharmacy
65 + women	This product will increase your social network	Buy one, get one free for your friend
Nurses	This product will save you time	Product placement in Scrubs and ER
Purchaser in a hospital	This product is durable & maintenance free	Tradeshow demonstrations
	This product is cost-efficient	Full-page GPO magazine advertisement
Student with partial blindness	This product will make note taking easier in class	Product demonstration during registration

The experiential elements include:
- Web Site
- Interactive Graphics (videos, apps, etc.)

C-2
C-3

DELIVERABLES: BUSINESS

The business student and the graphic designer should work closely together to ensure a proper fit between the marketing plan and the brand design. Most of the deliverables for business are based upon the book *Business Model Generation*, written by Alexander Osterwalder and Yves Pingeur.

The Business Model

Using the Osterwalder and Pingeur book, create a business model to support the concept you are developing. Write about these building blocks of the Business Model in as much detail as you can. We have made some modifications to this model by adding a section on Key Competitors.

1. Customer Segments
Who is this customer? What are their physiological, psychological, social and emotional needs? Can you categorize them? Are there distinct consumer segments among them? What demographic information do we have about them? How do they buy similar products?

2. Value Propositions
How can we describe this product-service system? What unique value will this system deliver? How will it address customer needs in a more appropriate way? Are we solving one or several of their problems? Does our offering include several products and services? Are we addressing the customers' functional, brand, status, price, convenience, usability and accessibility needs through our value proposition?

3. Channels
How can we best communicate our value proposition(s) to our customers? What are all the channels through which we can reach our customers? Which are the most appropriate ones for this concept and why? How do we make customers aware of our offering? How do we help our customers evaluate their choices? How can we assist our customers to buy our product-service system with ease and convenience? How do we deliver the offering to our customer? How do we provide after-sales service, maintenance, repair, repurchase, recycling or disposal?

4. Customer Relationships
What kinds of relationships should we develop with our customers? What do they expect from us? How can we best deliver that? Should these relationships be based upon one-on-one personal assistance, self-service, automated services, or anything else? What are the cost-benefits of these relationships? What can we do to create a loyal community? And how can we serve this community well?

5. Revenue Streams
What are the existing revenue streams for similar products? What are our customers willing to pay for these offerings? How much more will they pay for added value? What can we do to assist our customers in being able to afford and purchase our offerings (grants, government assistance, loans)? Are there multiple revenue streams that we could explore (direct retail, dealer network, leasing, licensing, etc.)?

6. Key Resources
What are all the resources that will be needed in order to deliver this product-service system to our customers? What are the physical resources that will be necessary (factories, machine tools, office space, vehicles, supplies, distribution networks, etc.)? What human resources will be needed (researchers, engineers, designers, marketing personnel, supply chain managers, factory workers, office staff, etc.)? Are there any special intellectual resources (licenses, patents, customer databases, marketing lists, trend reports, financial

data, etc.) that will be needed? And finally, what kinds of financial resources (cash, lines of credit, loans, etc.) will be needed?

7. Key Activities
What are the most critical activities that need to be performed in order to deliver this value proposition to the customers? For example, for Intel, Key Activities are microprocessor research and development, while for Microsoft this would be software development. Arizona State University's Key Activities focus on delivering education, while Herman Miller's Key Activities are furniture manufacturing. These activities can be manufacturing of goods, managing databases, conducting research, and so on. List Key Activities for the entire process that includes production of goods, establishing customer relationships, developing channels, creating revenue streams, and establishing key partnerships.

8. Key Partnerships
Do we need to establish close partnerships with any other organizations to succeed? Which non-competing groups can we engage? Are there any opportunities for co-branding? Which suppliers are needed to ensure quality production? Are there any critical resources that only a Key Partner can provide? And are there any Key Activities that we need each of the partners to perform?

9. Key Competitors
Answer the following questions regarding the concept:
Who are they? How do they compare with your company in size? Do they operate in the same markets as you? Who are the leaders in new innovations? Where are they located? What products do they manufacture/sell? How does their pricing compare with your own? What sales/distribution channels do they use? Have they recently introduced new products?

10. Cost Structure
Of all the activities that need to be performed in order to deliver our product-service system to the customer, what are the major costs that will be incurred? Is this a cost-driven business in which customers are very sensitive to price and therefore costs have to be kept low? Or are customers willing to pay more for a high-quality product-service system? What are all the fixed costs and what are the variable costs that need to be planned for?

The Business Model Canvas
Once you have the summary information above, plug it into the Business Model Canvas to get a visual representation of your model.

Listing and Testing Assumptions
In order to ensure the validity of the business model, in each phase, create a list of assumptions and test them. For Phase 5, write a hypothesis statement for all the assumptions you have made for Sections 1 through 6 of the Business Model. Follow that up with 1-3 ways to test that hypothesis. Write a "pass/fail" test for each hypothesis that can help validate the assumptions. Perform the test and explain the results and learning points. And finally, explain any pivots that occurred.

Empathy Map and What If Questions
Refer to the *Business Model Generation* book written by Alexander Osterwalder and Yves Pingeur. The Empathy Map is explained on pages 130-133 and the What If Questions are explained on pages 140-141. Create these for the selected concept.

Phase 06

FINALIZING THE CONCEPT

In this phase you will start finalizing details about the product design solution, the business plan, the brand identity as well as the technical specifications.

PHASE 6 – FINALIZING THE CONCEPT

C-4

GOALS

The goals of this phase are to:

- Define final specifications for all aspects of the product design concept, its engineering, brand strategy, sustainability strategy and marketing/business plan
- Make updates to the Phase 05 information based upon feedback from faculty and sponsors
- Establish a foundation for the final phase

ASSIGNMENT

Start the process of finalizing the following:

- All functional and prototyping issues relating to the selected product design concept
- Aesthetic and ergonomic direction for the product design concept
- Message and aesthetic direction for the brand identity design
- Scope and content of the business model
- Life Cycle Assessment and sustainability strategy for the product and company

DELIVERABLES

This phase has the following deliverables.

Industrial Design Materials **Due: Wednesday, April 01**

- Biomimicry Deliverables
- Features List
- Sketch Packet
- Presentation Renderings
- Form Study/Ergonomic Models
- Product Architecture Models
- Human Interaction Documentation

Sustainability Deliverables **Due: Wednesday, April 01**

- Biomimicry Deliverables
- Life Cycle Assessment, Draft 01
- Sustainability Report, Draft 01

Engineering Materials **Due: Wednesday, April 01**

- Biomimicry Deliverables
- Product Architecture Documentation
- Functional Prototype Plan
- First-Level Evaluation Matrix
- Technical Report Draft 02

Visual Communication Materials **Due: Wednesday, April 01**

- Biomimicry Deliverable
- Innovation Proposal Draft 02
- Implementation Timeline
- Branding Standards

Business Materials **Due: Wednesday, April 01**

- Biomimicry Deliverables
- Service Strategy

- Update to the Business Model
- Update to the Business Model Canvas
- Listing and Testing Assumptions (Sections 7-12)
- External Forces and SWOT Analysis
- Financials

DELIVERABLES: INDUSTRIAL DESIGN

The product designer and the engineer should work closely together to ensure proper aesthetic development of the product chosen.

C-2

Biomimicry Deliverables

Now that you have a long list of functions, create a list of examples of solutions in nature that deal with the very functional problems that you are tackling. There are two ways of doing this, and as a team, explore both these ways.

a. Organism-Inspired Solutions: Go to http://www.asknature.org/ and look for model organisms (plants and animals) that perform some of the functions you have listed in you Function List. In addition to AskNature, we also have other sources available to you. Ask Elizabeth (eicash@asu.edu), use Google Scholar, or ask ASU's own Ask-a-Biologist (http://askabiologist.asu.edu/) for additional information. Brainstorm as a team when you do this exercise.
b. Deep Patterns in Nature: Using these principles will help us create product, graphic, engineering and business solutions that are sustainable. Brainstorm as a team, and generate as many solutions based on the categories of the Life's Principles table as possible.

Select four solutions related to industrial design that you can develop in some detail either by writing them out or drawing them. Remember our Idea Pages from last semester? You can use the same technique/ format if you choose to sketch out the ideas. If you choose to write them out, explain the idea in a couple of paragraphs.

Features List

Make a list of all the features of the product.

Sketch Packet

Based on your Design Language, begin exploring a wide variety of formal solutions, through thumbnail drawings as well as concept sketches. Consider conservative ideas, wild ideas, and everything in between (but make certain they all reflect your Design Language). Don't forget to resolve human factors issues with form, color or detail. Make sure to compose great pages of drawings with lots of ideas.

Presentation Renderings

Select the three best solutions from all of the concepts you explored and create one presentation-quality color rendering of each concept. You are free to use any techinque/technology for these (Photoshop, Illustrator, Rhino, Solidworks, etc.). Make sure each rendering communicates:

- Scale
- Context of use
- An image of a person (or people)
- Product graphics (logo, product name, etc.)

Product Architecture Models

Work closely with your engineer on this assignment. Create three physical models in the appropriate scale of the product's inner components. Use these alternatives to evaluate which product architecture is most appropriate for the target users from an ergonomic perspective and which is the best for the design language. Identify the components either through color, labels or both.

Form Study/Ergonomic Models

Create form study models of your top three product ideas. Unless your product is really, really large, this should be full-scale so that you can evaluate it from a human factors and ergonomics perspective. The model should be fabricated with appropriate materials (EPS, cardboard, etc.). Include rough graphic depictions (on displays, for example) as required.

Human Interaction Documentation

C-2

Human factors is, at a gross level, used to figure out whether an object should be carried in a pocket or strapped to the wrist or hung by neck, and it is used at a finer level to specify dimensions of handles, colors of displays, etc. The first kind, also referred to as macro-ergonomics can occur during functional development, and the latter, also referred to as micro-ergonomics, during both functional as well as aesthetic development. Human Factors analysis will be used to select one of the three product architecture variations that you will develop. The final concept will be used for recommending materials and manufacturing processes.
Include the following information:

- A Human Interaction Diagram of the product that identifies all the locations and nature of human interaction
- An interface chart that includes pre-operational, operational, as well as post-operational activities.

DELIVERABLES: SUSTAINABILITY

Biomimicry Deliverables

C-2
C-3

Now that you have a long list of functions, create a list of examples of solutions in nature that deal with the very functional problems that you are tackling. There are two ways of doing this, and as a team, explore both these ways.

a. Organism-Inspired Solutions: Go to http://www.asknature.org/ and look for model organisms (plants and animals) that perform some of the functions you have listed in you Function List. In addition to AskNature, we also have other sources available to you. Ask Elizabeth (eicash@asu.edu), use Google Scholar, or ask ASU's own Ask-a-Biologist (http://askabiologist.asu.edu/) for additional information. Brainstorm as a team when you do this exercise.
b. Deep Patterns in Nature: Using these principles will help us create product, graphic, engineering and business solutions that are sustainable. Brainstorm as a team, and generate as many solutions based on the categories of the Life's Principles table as possible.

Select four solutions related to sustainability that you can develop in some detail either by writing them out or drawing them. Remember our Idea Pages from last semester? You can use the same technique/format if you choose to sketch out the ideas. If you choose to write them out, explain the idea in a couple of paragraphs.

Life Cycle Assessment, Draft 01

C-2

According to Vermont-based sustainability consulting firm Earthshift, "Life Cycle Assessment (LCA) is an analytical tool used to quantify and interpret the environmental flows to and from the environment, over the entire life cycle of a product or service. By analyzing the impacts throughout the product life cycle, LCA provides a comprehensive view of the product or process, and a more accurate picture of the true environmental trade-offs in product selection." Conducting an LCA for a product is a complex process and you will use the Earthshift software for the solutions you are developing as a team. You will start the process in Phase 06 and finish it in Phase 07.

Sustainability Report, Draft 01

C-3

One of the main deliverables for this semester is your Sustainability Strategy for the concept being developed by your team. In this document, include answers to the following questions. How do you define sustainability for your new entrepreneurial company? What are your responsibilities to People (all stakeholders), Planet (environment), and Profits (your company's ability to continue as a going concern)? How do you balance

the constraints that each of these large and complex areas puts on your company? What is the role of sustainability in the company's mission? What are the potential environmental impacts of your product-service system if you think about its complete lifecycle from raw materials, through manufacturing, transportation, lifetime use and end of life? What social issues and risks face your company? Why? Think of labor conditions when you recommend outsourcing. Can you authorize third party regulators to check your vendors? What does the company's CSR (Corporate Social Responsibility) code of conduct look like? These issues will be central to the strategy. In Phase 05, you will start by developing this strategy and build it over Phases 06 and 07 through the rest of the semester.

DELIVERABLES: ENGINEERING

The engineer and the product designer should work closely together to ensure proper functional development of the final product-service system.

C-2

C-3

Biomimicry Deliverables

Now that you have a long list of functions, create a list of examples of solutions in nature that deal with the very functional problems that you are tackling. There are two ways of doing this, and as a team, explore both these ways.

a. Organism-Inspired Solutions: Go to http://www.asknature.org/ and look for model organisms (plants and animals) that perform some of the functions you have listed in you Function List. In addition to AskNature, we also have other sources available to you. Ask Elizabeth (eicash@asu.edu), use Google Scholar, or ask ASU's own Ask-a-Biologist (http://askabiologist.asu.edu/) for additional information. Brainstorm as a team when you do this exercise.
b. Deep Patterns in Nature: Using these principles will help us create product, graphic, engineering and business solutions that are sustainable. Brainstorm as a team, and generate as many solutions based on the categories of the Life's Principles table as possible.

Select four solutions related to engineering that you can develop in some detail either by writing them out or drawing them. Remember our Idea Pages from last semester? You can use the same technique/format if you choose to sketch out the ideas. If you choose to write them out, explain the idea in a couple of paragraphs.

Product Architecture Documentation

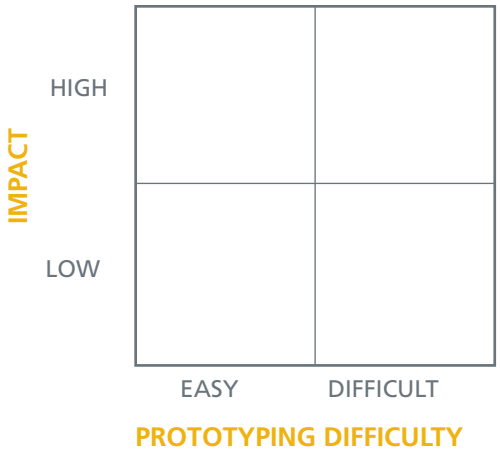
Product architecture is the arrangement of the functional elements of a product into physical blocks (the layout of the basic components of the product and how things fit together). These blocks are also referred to as subsystems of the product that can further be broken down into subassemblies, components and parts. Functional elements are individual operations and transformations that contribute to the overall performance of the product, whereas the physical elements are the parts, components and subassemblies that implement the product's functions. Your documentation should include the following information:

A listing of all functional elements organized in a block diagram.
A listing of all components and their functions.
Show and explain element interfaces including mechanical, electrical, chemical, etc.
Prove that the technical components will fit in the allotted space.
Three, alternate exploded views of how the sub-systems could be organized physically.
(Do not show the interior elements floating in space, create the product housing however rudimentary, and center lines. Take into account the sizes of the components and be realistic based on research of sizes, weights and interfaces. Use www.thomasregister.com and company catalogs for technical components).
List advantages and disadvantages of each layout.

Functional Prototype Plan

Specify what functional aspects of the product you have chosen to prototype and include the specific performance specifications you will demonstrate with the prototype. You may not be able to prototype

everything in the product, but choose the most interesting, risky and doable functions to test in the prototype. For example, if the product has to support a person's weight, specify the anthropomorphic details and use stress analysis methods to analyze the theoretical product structure and then test it under load conditions to prove that it survives.



Use the diagram above for determining which functions to prototype. Make a list of all of the functions from your decomposition and, for each one, propose a prototype to prove its success. Create a 2x2 grid as shown. Classify all product functions from your decomposition into the quadrants. You will want to concentrate on prototyping the easy/high impact functions, not prototyping any of the low impact functions and maybe trying one of the high impact/hard functions.

First-Level Evaluation Matrix

C-2

Any rigorous evaluation of the product's engineering must take into account the customer needs. Therefore, a direct comparison with the customer needs from the House of Quality is a good method for evaluation. To structure the evaluations, a matrix can be created to rank how well the various alternative designs satisfy the customer requirements. A first-level evaluation matrix makes a simple comparison between alternative designs and a standard benchmark design. Alternative designs are evaluated as being better, worse, or the same as the benchmark. The columns below the alternative designs are filled with symbols that indicate how the design compares to the benchmark. Note that the alternative designs are not compared against each other, only against the benchmark product. The numbers of positive, negative, and equal criteria are summed at the bottom of each column. This first-level evaluation sorts the alternative designs into two classes – those better than the benchmark and those worse.

Technical Report, Draft 02

Place the additional information generated in this phase to the Technical Report you started in Phase 5.

DELIVERABLES: VISUAL COMMUNICATION DESIGN

The graphic designer and the business student should work closely together to ensure proper brand and marketing development of the final product-service system.

Biomimicry Deliverables

C-2

Now that you have a long list of functions, create a list of examples of solutions in nature that deal with the very functional problems that you are tackling. There are two ways of doing this, and as a team, explore both these ways.

a. Organism-Inspired Solutions: Go to http://www.asknature.org/ and look for model organisms (plants and animals) that perform some of the functions you have listed in you Function List. In addition to AskNature,

we also have other sources available to you. Ask Elizabeth (eicash@asu.edu), use Google Scholar, or ask ASU's own Ask-a-Biologist (http://askabiologist.asu.edu/) for additional information. Brainstorm as a team when you do this exercise.

b. Deep Patterns in Nature: Using these principles will help us create product, graphic, engineering and business solutions that are sustainable. Brainstorm as a team, and generate as many solutions based on the categories of the Life's Principles table as possible.

Select four solutions related to graphic design that you can develop in some detail either by writing them out or drawing them. Remember our Idea Pages from last semester? You can use the same technique/ format if you choose to sketch out the ideas. If you choose to write them out, explain the idea in a couple of paragraphs.

Innovation Proposal Draft 02

C-3

Continue to work on the Innovation Proposal and add relevant information developed in Phase 5. At the end of Phase 6, you should have a final design for the book and your main task is designing the information about graphic design, industrial design, business and engineering developed in Phase 5. Include the following content:

Introduction
- Table of contents
- Project team, sponsor, etc.
- The problem being solved
- Brief description of the product-service system with images
- User profile

Product Innovation
- Product Appearance Benchmarking
- Selected Design Language
- Presentation Renderings
- Function Tree
- Morphological Chart
- Specification Sheet

Service Innovation
- Listing of Services

Brand Experience Innovation
- Brand Benchmarking
- Brand Identity Design

Business Model Innovation
- The Business Model
- The Business Model Canvas

Innovation through Sustainability
- Biomimicry Materials
- Systems Map
- Stakeholder Map
- Sustainability Report

Implementation Timeline

Think of all the processes that you will need to plan for before and after launching the product. Make a list of all these activities and map them out on a timeline. The following is a list of some activities that you might want to consider. This is just a starting point, and you should add/modify depending upon the specifics for your product-service system.

Create the Team
Seek Investment/Funding
Consumer and Market Research

Early Product Development
Seek Additional Funding
Create Spin-off
Develop Prototype Alpha
Develop Prototype Beta
Usability testing of Prototype
First Billboard to Build Product Buzz
First Advertisement in Magazine
Test Product Launch in Columbus, Ohio
Test Product Launch in Berlin, Germany
Tradeshow launch

Once you have all the activities listed, create a visual timeline mapping them over time.

Branding Standards
An explanation of the standards of usage of the brand elements such as logo, color, type, etc.

DELIVERABLES: BUSINESS
The business student and the graphic designer should work closely together to ensure proper brand and marketing development of the final product-service system.

C-2
C-3

Biomimicry Deliverables
Now that you have a long list of functions, create a list of examples of solutions in nature that deal with the very functional problems that you are tackling. There are two ways of doing this, and as a team, explore both these ways.

a. Organism-Inspired Solutions: Go to http://www.asknature.org/ and look for model organisms (plants and animals) that perform some of the functions you have listed in you Function List. In addition to AskNature, we also have other sources available to you. Ask Elizabeth (eicash@asu.edu), use Google Scholar, or ask ASU's own Ask-a-Biologist (http://askabiologist.asu.edu/) for additional information. Brainstorm as a team when you do this exercise.
b. Deep Patterns in Nature: Using these principles will help us create product, graphic, engineering and business solutions that are sustainable. Brainstorm as a team, and generate as many solutions based on the categories of the Life's Principles table as possible.

Select four solutions related to business that you can develop in some detail either by writing them out or drawing them. Remember our Idea Pages from last semester? You can use the same technique/format if you choose to sketch out the ideas. If you choose to write them out, explain the idea in a couple of paragraphs.

Listing of Services
All products need to have services built around them as a form of support. These services might include pre-sales knowledge about offerings to consumers, in-store/online service, post-sale service, maintenance and repair service, and end-of-life service (recycling, disposal). What kinds of services will you offer with your product concept? Create a listing of all these services.

Update to The Business Model
Based upon the new information generated in Phase 5, add more detail to the business model. If there were sections for which you did not have information in the last phase, make sure you find it and include in for Phase 6.

The Business Model Canvas
Update the Business Model Canvas.

Listing and Testing Assumptions

For this phase, write a hypothesis statement for all the assumptions you have made for Sections 7 through 12 of the Business Model. Follow that up with 1-3 ways to test that hypothesis. Write a "pass/fail" test for each hypothesis that can help validate the assumptions. Perform the test and explain the results and learning points. And finally, explain any pivots that occurred.

External Forces and SWOT Analysis

Based on the *Business Model Generation* book, closely examine and write about External Forces explained on pages 200-209, and perform a SWOT analysis of the business model explained on pages 216-223.

Financials

Develop a set of financials for your business model for the following categories.

Startup Budget: Consider your Key Activities that describe what you will need to pay for in order to get this business or product launched. These are the expenses that only occur at launch and will not be recurring costs into the future. Examples of such expenses includes research and development, prototype development and manufacture, legal costs to set up company, etc.

Operating Budget: Here too, consider your Key Activities that describe what will be a recurring cost in order to operate this business. These are the costs that will be necessary to run the business on a monthly basis Examples of recurring costs typically include rent, manufacturing, packaging, customer service, etc.

Sales Forecast: Consider your Revenue Stream, use the Bottom-up Method to identify how sales will be made, and create a forecast of anticipated sales per month for year 1 and quarterly for years 2 and 3. Consider future growth of your product or your company such as entering new markets or offering add-on products. Look at your Customer Relationships section of your Business Model Canvas for guidance.

Cash Flow Statement: Ensuring that you have enough cash to run the business is a key aspect of a startup. This will influence how much capital you raise in order to launch. Consider the outflow and inflow of cash (not payables or receivables) and address your Burn Rate (monthly outflow of cash needed to keep the business running).

Phase 07

DOCUMENTATION, PRESENTATION & EXHIBITION

In this phase you will document the work done over the semester for a presentation and exhibition at the Ice House on Thursday, May 08, 2014 from 4:00pm to 5:30pm, and 6:00pm to 8:00pm.

PHASE 7 – DOCUMENTATION & EXHIBITION

C-4

GOALS

The goals of this phase are to:

- Develop materials (text-based, visual and presentational) to communicate/promote the project to an invited audience.
- Make updates to the Phase 06 information based upon feedback from faculty and sponsors
- Set up the exhibit and present the project.

ASSIGNMENT

Develop all final materials for the class including the following:

- The technical report and final proof-of-concept prototype
- The final product design and related materials
- The final brand identity design and related materials
- The final business model
- The final sustainability strategy

DELIVERABLES

This phase has the following deliverables.

Industrial Design Materials **Due: Monday, May 04**

- Biomimicry Materials
- User Experience Storyboard
- Final Appearance Model
- Exploded View

Sustainability Deliverables **Due: Monday, May 04**

- Biomimicry Deliverables
- Life Cycle Assessment
- Final Sustainability Report
- Electronic Portfolio

Engineering Materials **Due: Monday, May 04**

- Biomimicry Materials
- Third Level Evaluation Matrix
- Safety Considerations
- Risk Matrix
- Bill of Materials
- Okala Ecological Impact Factor Assessment
- Control Drawings
- Proof-of-Concept/Functional/Simulation Prototype
- Final Technical Report (in a Binder)

Visual Communication Materials **Due: Friday, May 08**

- Biomimicry Materials
- Innovation Proposal (Final) 2 copies
- Posters
- Select Media Option(s)
- Interactive/Web/Motion Piece
- Digital Files

Business Materials **Due: Monday, May 04**

- Biomimicry Materials
- Reasonable and Justifiable Social and Environmental Claims
- Final Product-Service System Pitch
- Final Business Model
- Final Business Canvas
- Final Listing of Services
- Business Binder

DELIVERABLES: INDUSTRIAL DESIGN

C-2
C-3

Biomimicry Deliverables

In the final Innovation Proposal, there will be a section called "Biomimicry Materials." For this section, select 2 nature-inspired industrial design solutions that you have incorporated in your final product design. Explain these in detail. You should include information about your process, photos of the organism if applicable, sketches of your solution and any other detail that you think is critical in explaining how you achieved the function using biomimicry.

User Experience Storyboard

Create an illustration showing context and how a person interacts/uses the concept. This can be done by drawing the storyboard or by photographing the form study models in use.

Exploded View

Create an illustration showing all the critical components of the product opened up along a vertical or diagonal axis. Make sure you show a center-line and other necessary guide lines to help understand how the components are assembled.

Final Appearance Model

Once your design is finalized, build a final appearance model that shows the product as it would look in production. Use the right type of materials, build it in parts, and make sure it is well painted to represent the final design.

DELIVERABLES: SUSTAINABILITY

C-2
C-3

Biomimicry Deliverables

In the final Innovation Proposal, there will be a section called "Biomimicry Materials." For this section, select 2 nature-inspired sustainability solutions that you have incorporated in your final concept. Explain these in detail. You should include information about your process, photos of the organism if applicable, sketches of your solution and any other detail that you think is critical in explaining how you achieved the function using biomimicry.

Final Life Cycle Assessment

According to Vermont-based sustainability consulting firm Earthshift, "Life Cycle Assessment (LCA) is an analytical tool used to quantify and interpret the environmental flows to and from the environment, over the entire life cycle of a product or service. By analyzing the impacts throughout the product life cycle, LCA provides a comprehensive view of the product or process, and a more accurate picture of the true environmental trade-offs in product selection." Conducting an LCA for a product is a complex process and you will use the Earthshift software for the solutions you are developing as a team.

Final Sustainability Report

C-2
C-3

One of the main deliverables for this semester is your Sustainability Strategy for the concept being developed by your team. In this document, include answers to the following questions. How do you define sustainability for your new entrepreneurial company? What are your responsibilities to People (all stakeholders), Planet (environment), and Profits (your company's ability to continue as a going concern)? How do you balance the constraints that each of these large and complex areas puts on your company? What is the role of sustainability in the company's mission? What are the potential environmental impacts of your product-service system if you think about its complete lifecycle from raw materials, through manufacturing, transportation, lifetime use and end of life? What social issues and risks face your company? Why? Think of labor conditions when you recommend outsourcing. Can you authorize third party regulators to check your vendors? What does the company's CSR (Corporate Social Responsibility) code of conduct look like?

Electronic Portfolio

Create an electronic portfolio that showcases your work as a sustainability student at ASU. You will be guided though the process of creating the e-portfolio over the semester. The focus of the portfolio is to showcase your work in InnovationSpace as well as work you have done over the past four years. This will serve as a repository of your project deliverables and other materials that will be beneficial while seeking employment, going to graduate school and also as an archive of all your work.

DELIVERABLES: ENGINEERING

Biomimicry Deliverables

C-2
C-3

In the final Innovation Proposal, there will be a section called "Biomimicry Materials." For this section, select 2 nature-inspired engineering solutions that you have incorporated in your final concept. Explain these in detail. You should include information about your process, photos of the organism if applicable, sketches of your solution and any other detail that you think is critical in explaining how you achieved the function using biomimicry.

Third-Level Evaluation Matrix

C-2

When the concepts are improved and new ideas are captured in more advanced conceptual designs, the engineers will add resolution to their evaluation. This can be accomplished through second and third-level evaluation matrices. You need not create a second-level matrix. The third-level matrix evaluates each alternative design against each of the customer needs based on an absolute scale that may range from 0-4 or 0-10. Finally, the total score for each design is added up at the bottom of the matrix. The final score of each solution is divided by the maximum possible score to evaluate their relative success. In the third-level evaluation matrix, an importance value is assigned to each criterion. The weighted sum of each design is then compared to give a higher-resolution evaluation. Create a Third-Level Evaluation Matrix for your product based upon the example on page 25.

Safety Considerations

In order for your design solution to be safe to the consumer, the manufacturer and the maintenance professional, you have to consider the following safety recommendations. Explain which of the following safety considerations you have incorporated into your product.

1. Design in safety in the solution from the start.
2. Utilize guards where necessary.
3. Anticipate operator errors and design to minimize them.
4. Restrict improper use.
5. Accommodate unusual operating conditions.
6. Utilize redundancy.
7. Design safe failure modes.
8. Facilitate easy maintenance and repair.
9. Add well-designed warning labels and systems when appropriate.

Risk Matrix

The Risk Matrix is a tool allows engineers to visualize severity and the probability of risks that a product might present, allowing them to anticipate and address risks in advance. Remember that as the necessary functions are refined and updated, new risks may emerge and other risks may disappear. It is important to continually update the potential risks as they are revealed during the design process. As the list of risks is developed, each item is assigned a severity and probability. The rows in a Risk Matrix categorize the severity of the risk, and they range from Catastrophic to Negligible. The columns of the matrix rate the probability of the risk causing a hazardous event, and this ranges from Frequent to Unlikely. Each possible risk is placed in the matrix in terms of how it rates on these two scales. Therefore, the risks listed in the upper left-hand corner are the most critical because they are frequently occurring catastrophes. When such a matrix is created, engineers are able to identify the most important risks and work to eliminate or mitigate them. The goal of this exercise is to move the risks from the top-left corner down and to the right. Create a Risk Matrix for your product based upon the example on page 42.

Bill of Materials

Create a table of all components, quantities, costs, part numbers and source. The business student will need this information so they can do an overall economic analysis. Find out when they need this information and then add it to your project schedule. The Bill of Materials should include:
Material for each component
Finish for each component
Process used to manufacture each component
Justification of material and process selection

Okala Ecological Impact Factor Assessment

Using an ecodesign methodology called Okala, assess your new design and an existing comparative product in terms of environmental impact. Show all your calculations as well as the final numbers for both products. You will learn about this methodology in class.

Control Drawings

Create part drawings that highlight key dimensions of the product. Engineering drawings are a formal and precise way of communicating information about the shape, size, features and precision of physical objects. However, with the ubiquitous use of virtual models, in some cases [often for simple products or smaller companies] do not use full engineering drawings but control drawings that specify critical dimensions only.

Proof-of-Concept/Functional/Simulation Prototype

Create a working model demonstrating some of the key functional requirements. In some cases, you may not be able to demonstrate the functionality. In these cases, if there are means of simulating the functionality using other means, that should work as well.

Final Technical Report

C-3

All the information that you have generated throughout the semester should be organized into a binder and titled Technical Engineering Report.

DELIVERABLES: VISUAL COMMUNICATION DESIGN

Biomimicry Deliverables

C-2

C-3

Select 2 nature-inspired graphic design solutions that you have incorporated in your final brand/packaging. Explain these in detail. You should include information about your process, photos of the organism if applicable, sketches of your solution and any other detail that you think is critical in explaining how you achieved the function using biomimicry.

Innovation Proposal

C-3

This is the final book about the project that you have been working on for the entire semester. Include the following information in the final Innovation Proposal. Keep in mind that this book may be seen by people who are not aware of our process, and so you may have to give very brief description of what some of these things mean.
Divide this document into these major components:

Introduction
- Table of contents
- Project team, sponsor, etc.
- The problem being solved
- Brief description of the product-service system with images
- User profile

Product Innovation
- Product Aesthetic Benchmarking
- Selected Design Language
- Final Product Renderings
- User Experience Storyboard
- Human Interaction Diagram
- Exploded View

Technology Innovation
- Function Tree
- Morphological Chart
- Specification Sheet
- Final product architecture
- Bill of Materials
- Okala Ecological Impact Factor Assessment

Service Innovation
- Listing of All Product-Related Services

Brand Experience Innovation
- Brand Benchmarking
- Brand Identity Design
- Branding Guidelines
- Images of Select Media Options
- Implementation Timeline

Business Model Innovation
- The Business Model
- The Business Model Canvas
- Financials
- Reasonable and Justifiable Social and Environmental Claims

Innovation through Sustainability
- Biomimicry Materials
- Solutions Inspired by Nature for Each Discipline
- Systems Map
- Stakeholder Map
- Lifecycle Assessment
- Sustainability Report

Posters

Create posters that demonstrates your solution. We are giving you liberty in figuring out what you would want on these posters, but the following information is necessary to include.

- An image of the product system

- An image of the name/logo
- Brief overview and significance of the problem being solved

Media Options
Select the media options that you would like to demonstrate for your project (sales brochure, packaging, print ad, website, etc.). Pick one or two to mock up for the show.

Digital Files
Submit your poster files (pdf and Adobe Preflight package), the Innovation Proposal file (pdf and Adobe Preflight package), the poster, and the interactive piece. You can do this via a file sharing service.

DELIVERABLES: BUSINESS

Biomimicry Deliverables
C-2
C-3
In the final Innovation Proposal, there will be a section called "Biomimicry Materials." For this section, select 2 nature-inspired business solutions that you have incorporated in your final business model canvas. Explain these in detail. You should include information about your process, photos of the organism if applicable, sketches of your solution and any other detail that you think is critical in explaining how you achieved the function using biomimicry.

Reasonable and Justifiable Social and Environmental Claims
C-3
Based upon the Sustainability Strategy that you have developed, the Okala Impact Factor Assessment done by the engineering students and other solutions developed by the design students that deal with sustainability and biomimicry, create a list of environmental and social claims that are reasonable and that can be substantiated though evidence. You will be given a handout to guide you through this process.

Final Product-Service System Pitch
Finalize the Product-Service System Pitch that was first developed by the team in Phase 5.

Final Business Model
You have been developing this over the entire semester. Finalize all the sections for inclusion in the Innovation Proposal and the Business Binder.

The Business Model Canvas
Finalize the Business Model Canvas.

Listing of Services
All products need to have services built around them as a form of support. These services might include pre-sales knowledge about offerings to consumers, in-store/online service, post-sale service, maintenance and repair service, and end-of-life service (recycling, disposal). What kinds of services will you offer with your product concept? Create a listing of all these services.

Business Binder
Put all the information that you have generated over the semester in this binder. This includes all you have written for your Business Model, the Business Model Canvas as well as all your assumptions. You are welcome to add other relevant information if it is critical and not available in other materials.

INNOVATIONSPACE