

# ISD 599-002 FALL (ISD 521) Development and Verification of System Design Requirements

## Professor

Robert F. Bordley  
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## Informal Project Coach:

Don Winter

## Class Time: 3:30 PM to 5 PM Tuesday and Thursday

Regular meetings with the project coach will be scheduled on Wednesday 1 PM (or earlier) based on student schedules

## Office Hours:

**On-Campus: 5 PM to 6 PM Tuesday and Thursday**

**Online: 6 PM to 7:00 PM Tuesday and Thursday**

**Available by e-mail: 8 AM to 3:30 PM Monday, Wednesday, Friday**

Course Description: Data collection and analysis techniques for developing and verifying requirements are studied: identifying, quantifying and prioritizing stakeholder objective, minimizing test procedures cost and limited versus mass-production strategies. Course work includes a term project. Knowledge of introductory statistics is required.

**Learning objectives:** As a result of this course, students will be able to:

- Understand the accepted methods for collecting information on stakeholder objectives (objectives elicitation)
- Formulate an adequate set of requirements based on stakeholder requirements and technical risk.
- Recognize when requirements are inadequate
- Understand the accepted methods for verifying compliance with requirements (requirement verification) and for conducting validation
- Demonstrate the ability to define requirements and verification plans
- Statistically analyze data collected from surveys, experiments and simulations in support of quantifying stakeholder objectives or verifying compliance with requirements.

## Required Textbook & Materials

- Pdfs on different kind data analysis software packages (both commercial and open-source) are provided on the class tools site.

**Note:** Professor Bordley does allow lecture recordings to be downloaded for offline viewing.

## ISD Software Access Policy (if applicable)

This course requires that you have access to data analysis software. For students using R, students are encouraged to download the software from <http://cran.r-project.org>. For students using software like Minitab or SPSS, the software will be available at the CAEN lab. Historically, access issues with CAEN

have been most common for online students and for any non-College of Engineering students. Here are the instructions for accessing the CAEN lab software:

<https://sites.google.com/a/umich.edu/isd-public/remotesoftware/connecting-to-caen-remote-software-with-webclient>

It is critical that you are able to log in to this software successfully PRIOR to your homework submission. As such, we require that all online students submit a screenshot documenting your access to your preferred software. This assignment will be counted toward your course participation grade and is due by Sept. 15, 2016

If you have any issue connecting to the software, please contact [isd-instructionalsupport@umich.edu](mailto:isd-instructionalsupport@umich.edu) and copy me on the message.

### Grade Distribution

(e.g.,)

Homework	20%
Piazza Participation	15%
Midterm	20%
Second Midterm	20%
Project	25%
Total	100%

### Grading Scale (recommended)

This course follows a standard ISD grading scale of A, B, C, D, and E. Grades will be assigned as follows:

A+ 97-100	B+ 87-89	C+ 77-79	D+ 67-69	E 59 and below
A 93-96	B 83-86	C 73-76	D 63-66	
A- 90-92	B- 80-82	C- 70-72	D- 60-62	

The minimum grade ranges may be adjusted based on class performance.

**Attendance Policy:** On-site students are expected to attendance 80% of the classes.

**Make-up and Late Work Policy:** Homework is due one week after assigned. Homework will be assigned a penalty of 5% for each day late

### Accessibility

ISD faculty are committed to ensuring equal access to learning for students with disabilities. The University of Michigan SSD Office provides accommodations and services free of charge to students that

register. Depending on the type and severity of the disability, the SSD Office makes every effort to provide the appropriate accommodation for academic success. Registered SSD students can arrange to receive services through their disability coordinator.

<https://ssd.umich.edu/topic/our-services>

**The College of Engineering Honor Code (recommended)**

All students in the class are presumed to be decent and honorable, and all students in the class are bound by the College of Engineering Honor Code. You may not seek to gain an unfair advantage over your fellow students; you may not consult, look at, or possess the unpublished work of another without their permission; and you must appropriately acknowledge your use of another's work. Any violation of the honor policies appropriate to each piece of course work will be reported to the Honor Council, and if guilt is established penalties may be imposed by the Honor Council and Faculty Committee on Discipline. Such penalties can include, but are not limited to, letter grade deductions or expulsion from the University. As your course instructor, I reserve the right for additional deductions of points for anyone found guilty of an honor code violation.

Homework Assignments: You may discuss individual homework assignment with your fellow students at the conceptual level, but must complete all calculations and write-up, from scrap to final form, on your own. Verbatim copying of another student's work is forbidden. You may not consult homework solutions from a previous term unless they are made available in a publicly accessible form. All group work is to be completed only within your own group. Your group can receive help **only** from the course instructors. At no time may you receive help from someone who is not a current instructor. You cannot speak with other groups about the problems, conceptually or otherwise, and you may not at any time look at, borrow, or possess another group's work.

## Weekly Topic Outline

Week 1	Introduction to class, the Systems Vee and data analysis software
Week 2	Identifying, classifying and segmenting Stakeholder Groups
Week 3	Value-Focused Thinking: How and Why Preferences need to be Quantified
Week 4	Methods for Gathering Information e.g., document research, historical data, Interviews, Clinics, fo
Week 5	Kinds of questions: Open-ended, multiple-choice, rankings, ratings, Likert scale, conjoint, etc. Qua intangibles (aesthetics, usability, portability, etc.)
Week 6	Statistics for Summarizing and Analyzing Responses to questions or outcomes of research
Week 7	Drawing Inferences from Statistical Analyses: the Bayesian Approach for Missing or Insufficient Da
Week 8	Defining the Project Objective Function: Additive, Linear and Multi-linear
Week 9	Defining Requirements and Assigning Margins
Week 10	Defining Verification Criteria
Week 11	Using Design of Experiments to test compliance with requirements
Week 12	Testing compliance with Quals, Proto-Quals and Piecewise Verification
Week 13	Verifying compliance using Simulation, inspection, similarity etc.
Week 14	Validation of requirements including Manufacturing Validation