

ID 8900 Spring 2012

Universal Design Investigations and Applications: Enigma Voting Machines

Catalogue Description

This course provides an advanced level to universal design focusing on real world applications of universal design on the usability of products and technologies for all individuals.

Objectives

Voting is an inalienable right guaranteed by the U.S. Constitution. Yet, almost two and a quarter centuries after the First Presidential Election, the design of voting machines remains an enigma. The problem is extremely complex and fraught with often conflicting design goals. Voting machines must be usable by all citizens, including those with diverse physical abilities, cultural backgrounds, technology experiences, civic engagement, literacy and language proficiency. Functionally, the machines must record votes accurately and securely to ensure privacy and that ballots are kept secret, yet they must be auditable so that recounts are possible. At the same time they must be flexible enough to fit within complex election management systems that have local, state, and national rules, oversight by many stakeholders, and a semi-volunteer work force. They must also be durable enough to withstand continuous set up, transport and storage and they must be affordable so they can be purchased by even the smallest election districts where resources are limited.

Historically, increasing voting accessibility has been implemented through legislation and standards, such as the Americans with Disabilities Act. These mechanisms typically produce a set of design requirements that create constraints, but do not communicate a design vision. *Universal Design Investigations and Applications: Enigma Voting Machines* utilizes both universal design and interaction design to create that vision. This is a research-oriented, project-based, 3 credit hour course where students will focus on the analysis of usability problems. The course will emphasize the acquisition of evidence-based methods to identify, understand, develop and substantiate new design solutions for all individuals, regardless of ability. Students will be expected to engage people with a variety of abilities to develop an understanding of the range of human ability and disability; and to apply that knowledge to the principles of universal design to solve usability problems with voting technologies.

Specifically, students will undertake a rigorous evaluation of the barriers and facilitators to the design of voting machines; analyze current voting technologies to determine where current technology fails to meet users' needs; identify new universal design solutions that will meet the needs of all users, including voters and election officials; and to integrate these changes into the design of a single system for all voters.

Learning Outcomes

ID or HCI experience is a prerequisite for this course. This is the graduate level course focusing on the application of evidence-based design methods to understanding and integrating the concepts of *Universal Design* and *Interaction Design* to help solve real world usability problems. The course will provide the student with:

- An understanding of the differences between accessible design and universal design solutions for voting technologies;
- Empathic and first-hand experience with the range of abilities that comprise human function;
- Analytical skills to identify usability problems with voting machines and collect the evidence to solve those problems;
- Skills and tools to apply the Principles of Universal Design and Interaction Design to design voting technologies that meet the complex requirements of voters and election officials;
- Experience in creating a universal design interface;

- Ability to document and articulate (both verbally and in writing) the application of evidence-based design methods to problems in Universal Design.

Course format

Instructional methods for teaching the course include: lectures, student-lead seminar discussions, group projects, presentation and project reviews, readings and in-class discussions. In addition, a real world project will analyze and develop new integrated design solutions to improve the usability of Voting Machines for all users.

Weekly Learning Activities

Tuesday classes are usually devoted to lectures. Thursdays are devoted to student-lead discussions, presentations, field trips and in-class exercises. Expectations for the week include:

- Lecture (1.25 hours)
- In-class exercises/discussion and field trips (1.25 hours)
- Offline Reading (1 hour)
- Assignments (2.5 hours)
- Total Hours (6 hours)

Scope of Work

There will be student-lead seminar discussion based on the readings throughout the semester. All students are expected to participate in the discussions, which will count for **25% of the grade**. In addition, there will be 1 group project. This is a real-world projects that will be considered as part of a 3-year collaborative project sponsored by the Election Assistance Commission. The project will count for **75% of the grade**

The purpose of the team project is to use all the learning experiences of the course to develop, prototype a universal design solution for a voting machine. The number of Principles that are addressed will be taken into consideration in assigning a final grade. Four Principles are a minimum. A higher degree of difficulty will be factored into those projects that address additional Principles. Projects should be innovative, thoughtful and push the envelope of design.

There is also a requirement for all graduate students to submit a substantive written paper incorporating documentation in the form of evidence (based on lectures and assigned readings) to support the premise of the presentation.

The project will be executed in teams of 3-4 students. There will be a total of four project assignments/presentations: preliminary design concepts, final design concepts, user evaluation report and final prototype. In addition, there will be several classes available for informal reviews. Models or prototypes can be physical and digital, but must be a valid and realistic representation or working model of the project's concept.

Final presentations should include a concise summary of the universal design goals and what users had difficulty using or were excluded from using the existing design; how those principles were addressed and what users are now included; and what, if any principles and users are still not addressed by the design.

All assignments given are due on the date indicated. Students are expected to complete all assignments by the dates indicated on the schedule. All presentation materials and supporting documentation should be turned in to the instructor. The instructor reserves the right to change the dates and modify assignments as necessary. Students will be notified of any changes in advance. Late assignments will be penalized 10% of total point value per calendar day.

General Responsibilities and Expectations

Students will be expected to be active participants and must bring motivation and enthusiasm to this course. Active participation in class discussions of readings and individual exercises is a key requirement. Students must complete the readings by the lecture date so that they may be able to lead the class discussion on their specific readings. Informal and formal presentations of group work will be also be required.

The class will use **T-Square** <https://t-square.gatech.edu/portal> for course material. T-Square will have a detailed list of lecture topics and electronic files of assigned readings. This syllabus is tentative and is subject to change during the course of the semester. The syllabus will be updated online. Students will be informed about the changes, but are responsible to check the T-Square site for changes.

Attendance: Students should attend all classes and work individually and in teams as the assignments dictate. Except as pre-arranged with the instructor or noted on the schedule as fieldwork outside class on Thursday project workdays, students are expected to be in class. Students will have two (2) unexcused absences. All other absences will require documentation. Please contact honor.gatech.edu to document the student absence. Classes will start on time. More than three (3) unexcused or undocumented absences or unexcused late arrivals (i.e., more than 15 minutes) will result in a grade % drop for class participation.

Participation: Student participation and quality of discussion based on understanding of the readings is imperative. Learning is a participatory process, benefiting from student/teacher and student/student interaction. Therefore, students will be expected actively participate in class. We all learn from each other. Participation will be measured by the student work in class, leading seminar discussions on the reading material, being interactive in class and listening attentively to lectures. To be successful in this course, you are expected to attend class on a regular basis and complete readings and other assigned work, including group assignments, prior to the designated class.

Deadlines: Students will upload their projects on T-Square by 4:30 pm (i.e., prior to class) the day it is due. It is the responsibility of the student to obtain any missed information or handouts given in class from a classmate. You should exchange phone numbers or email addresses with other students in the class to facilitate note sharing etc. To derive the maximum benefit from this class, interactive learning is required. You are responsible for all material and assignments covered during class. It is the student's responsibility to obtain information/notes/assignments from missed classes. Since a portion of your grade is based on class participation, attendance will influence this grade.

Final Deliverables

- Final prototype.
- Public presentation including overview of your problem statement and proposed universal design solution, analysis of proposed solution, details and final product rendering, illustrations and/or photos demonstrating your solution.
- Labeled CD with .ppt of final presentation
- One hardcopy 24" x 36" poster

Evaluation Criteria

Projects will be evaluated on demonstrated understanding and relevance to assignment criteria, clarity of representation, clarity of verbal presentation, and demonstration of commitment. Observations of contributions to solo and group activities, craft and quality of material submissions, and clarity of verbal and graphic presentations will also contribute to grade assessment.

Grading

Grading will be based on the Georgia Institute of Technology system (A=90-100, B=80-89, C=70-79, D=60-69, F=below 60). No plus or minuses will be applied to the final grade.

However, plus and minuses may be used for submissions during the semester. Final grades will be based on an aggregate point total for participation and attendance, facilitation and leadership and project presentations and related submissions.

Grading for classwork will be as follows:

	Point Value	% of Grade
Class Participation/Attendance	10	15%
Facilitation/Leadership	15	15%
Preliminary Design	10	10%
Final Design	10	10%
User Evaluation Report	15	10%
Final Prototype	40	40%

Course Topics

Unit	Unit Description
1	Voting Process and Products History of access to voting Legal issues and legislative acts History of voting technologies Voting system standards Certification of voting systems
2	Defining the Problem: Enigma Voting Machines <u>2.1. Voter Issues: Accessibility and Usability</u> The Nature of Ability Design Barriers to Accessibility and Usability Design Facilitators to Accessibility and Usability: Accessible Design, Assistive Technology and Universal Design <u>2.2 Management Issues: Flexibility, Security, Affordability</u> <u>2.3 Current Design Practices: Two solution paradigm - Typical vs. Accessible</u> Ballots Voting Machines Writing Instructions
3	Developing Solutions 3.1 Applying Universal Design and Interaction Design to the Design of Voting Machines 3.2 Investigations and Analysis of Current Voting Machines 3.3 Design Goals and Criteria 3.4 Development of New Concepts 3.5 Ideation 3.6 Prototyping 3.7 User Evaluation of Working Prototypes