APS1041 Syllabus2019
Inventrepreneurship (http://inventrepreneurship.com)
(Invention + Entrepreneurship)

Learn to be both an inventor and an entrepreneur!

Winter/ 2019, 12 lectures:
Jan 9, 16, 23, 30; Feb 6, 13; 27; Mar 6, 13, 20, 27; Apr 3.
Wednesdays from 6pm-9pm in MY330
Website: http://aps1041.com

Instructor: Professor Steve Mann, (mann@eyetap.org), http://wearcam.org/bio.htm

Guest Lecturers and Advisors:
Arkin Ai (VisionerTech Founder), Raymond Lo (Meta Co-Founder), Chris Aimone (InteraXon CTO and Co-Founder), Ken Nickerson (Kobo Co-Founder), Ajay Agrawal (Rotman CDL Founder), Norm Pearlstine (served as the Editor-in-Chief of the *Wall Street Journal*, *Forbes,* and Time, Inc.), Ryan Jansen (Transpod Co-Founder), Nahum Gershon (Father of Human-Information Interaction), Dan Braverman (MannLab COO/General Counsel) and others

Time/Location: Wednesday 6-9PM, MY330.

Lectures: One 3-hour lecture per week.

Office Hours: Immediately following each of the weekly 3-hour lectures.
Additional office hours can be arranged with the Instructor and with the Advisors.

I. Purpose:

This course is designed to 1) provide instruction and mentorship to students interested in the art and science of both invention and entrepreneurship and to 2) introduce Inventrepreneurship as a new field of teaching and academic inquiry. Course lectures and instructables will be rehearsed, recorded and made available online for select students around the world.

The main course deliverable will be a demonstration-ready prototype and patent application for an invention in the field of Phenomenological Augmented Reality/Wearable Computing/Humanistic Intelligence. It is expected that many students will go on to form startup ventures around their prototype, which will receive ongoing guidance and support.

Guest lecturers and mentors include Founders, CEOs, and CTOs from venture-capital backed companies in the U.S., Canada and China, many of which were born in Professor

Mann's Toronto lab, as well as connections with Mannlab Silicon Valley and Mannlab Shenzhen.

II. Overall Course Philosophy, Aims and Outcomes:

You can't invent the future without understanding the past. Accordingly, students will first study historical examples of the process of invention, ranging from the light bulb to phenomenological augmented reality, as they learn to use and understand fundamental tools of invention such as the vacuum tube and the cathode-ray-oscilloscope.

Students will then explore present-day research at MIT, Stanford, Shenzhen, and the University of Toronto, as well as future research and commercial applications (e.g. Metavision, InteraXon, Visionertech, etc.). Students will be taught the fundamentals of HI (Humanistic Intelligence) versus AI (Artificial Intelligence), and will learn how to formulate and nurture ideas, turn ideas into inventions, make market-ready prototypes, protect intellectual property, and form startup ventures, with the help of a supportive global ecosystem (Canada, the United States and China) consisting of mentors, friends and potential funders, sponsors, donors, and patrons.

Instruction will consist of both plenary and highly individualized mentorship for each student and their specific circumstances and interests. Therefore the course can and will accommodate a wide range of student interests, backgrounds, and disciplines; students from all departments are welcome.

III. Specific Learning and Evaluational Outcomes*:*

By the end of this course, students will:

- Know how to build a basic electro-mechanical wearable device, PAR, or HI product prototype by using computer-aided design, rapid prototyping machines (3D printing), and various other desktop manufacturing tools.

- Have a ready-to-file patent application (students will get hands on experience in patent writing and applications, with examples); and

- Have a functioning prototype ready for demonstration.

Students will learn how to quickly turn ideas into inventions through a range of time-scales ranging from quick and sloppy "rapid prototyping" (rapid reduction-to-practice) to more well-made (longer time scale) prototypes designed for demonstration to others. Whereas other engineering courses often teach a slower more methodological approach akin to classical music, in this course, students will also learn "tinquiry" (tinkering as inquiry), more akin to jazz music (i.e.. quick improvisation, often making working prototypes to turn ideas into inventions in 90 minutes or less). Formal large lectures will be given, but there will be ample one-on-one and small-group mentorship as well.

IV. Teaching Methodology, Format and Procedures:

The course will be taught using the new medium of phenomenological AR (Augmented Reality) and Open EyeTap. The courseware and textbooks will be generated using special eyeglasses and pointing devices provided by MannLab (http://mannlab.com) so that students can quickly touch, grasp, and feel fundamental past, present, and future concepts, and become great inventors and visionaries. Students will be invited to generate future courseware, and the process of writing the courseware will be a participatory process.

V. Selection Criteria

If this course is over-subscribed, priority will be given to those students who have demonstrated initiative by doing one or more of Professor Mann's Instructables. To guarantee full access to resources, this course will have limited enrollment. Students who enroll in this course should be able to demonstrate their proficiency in making things. The easiest way to demonstrate this ability, and to see if there's a good match to the student's interest, is to complete one or more of Professor Mann's Instructables (http://www.instructables.com/member/SteveMann/instructables/) and post the results (click "I made it" and post a result, pictures, text, etc.).

The course instructor devotes a lot of time to individual one-on-one mentorship of students, and will respond individually to each "I made it" post. Completing one or more of these Instructables will give students the opportunity to demonstrate aptitude for making things, and to get a sense of what kinds of topics the course instructor is best equipped to help you with.

VI. Course Readings:

Selected articles and publications from http://www.eyetap.org/publications and from http://weartech.com, as well as AR Metavision content. Additional readings and Instructables will be posted on http://wearcam.org and http://www.instructables.com/member/SteveMann/instructables/ from time-to-time.

VII. Grading Procedures:

Grades breakdown is:

- Assignments (15%)
- Labs (25%)
- Final course project (60%)

Note that assignments and labs merge into the four "Assignments" worth 10% each, and due at the beginning of even-numbered lecture periods of Lectures 2, 4, 6, and 8. We consider, therefore, that about three-eighths of every assignment is "lab-like" in nature.

VIII. Tentative Course Schedule

(*May change to accommodate guest presenters & student needs or interests*). Every week there is one 3 hour lecture or lab/assignment/presentation. These alternate between lectures

(even-numbered) and labs/assignments/presentations (odd-numbered).

Lecture 1 (Jan. 9): Introduction, philosophy, "Jazz model" (http://wearcam.org/jazz.htm) of entrepreneurship, Course instructor's inventions showcase (http://wearcam.org/mannventions.htm).
How to summarize an invention; introduction to the LaTeX typesetting language.
How to do technical + business drawings; introduction to the Inkscape drawing program.
Assignment 1, due at beginning of Lecture 2.
In 5 pages or less, using the LaTeX typesetting language, (a) summarize any one of the approximately 35 example inventions provided, and suggest possible improvements, or (b) discuss possible combinations of these inventions, or (c) discuss extensions to one or more of the inventions. Include at least one SVG drawing, using Inkscape (freely available for most operating systems), to illustrate the invention(s) or extension/combinations to it/them.

Lecture 2 (Jan. 16): Presentations and critique, worth 10% of course grade. 5% for the written component of not more than 5 pages, and 5% for oral presentation and critique in-class. Maximum 5 minutes* per-person presentation (*may change but changes will be announced prior to Lecture 2).

Lecture 3 (Jan. 23): History of great inventors and their inventions.
What is the most patented, iconic, or canonical invention of all time? Answer: the mousetrap (mostly patented invention), and the light bulb (most iconic/symbolic)... "lightbulb moment".
Invent a better mousetrap and the world will beat a path to your door.
How the light bulb led to most modern inventions...
The light bulb, vacuum tube, transistor, cathode-ray tube, oscillograph, television, radar, computer, wearable computer, phenomenological augmented reality, big data (AI + surveillance), and little data (HI + sousveillance).
Assignment 2 due at the beginning of Lecture 4: Novice level: build a mousetrap.
Advanced level: Invent a better mousetrap, or build a light bulb (your choice).

Lecture 4 (Jan. 30): Presentations of your mousetrap (or lightbulb). 10% of your final grade.

Lecture 5 (Feb. 6): Patenting and Patents.
How to write a patent application in LaTeX.
How to create drawings for patenting purposes using Inkscape.
How to win as a plaintiff in a patent infringement lawsuit.
How to defend yourself in a court of law.
On the importance of evidence.
Introduction to Dan Braverman, MannLab's Chief Legal Counsel.
Introduction to Dan's accomplishments:

- Princeton University: What it's like to be in Princeton's top 1% elite society;
- Harvard Law School: Lessons learned.
- Black Rock Capital: AUM (Assets Under Management), > $6 trillion US.

Assignment 3: Write a patent application using the provided LaTeX template.
Include drawings created in Inkscape.

Lecture 6 (Feb. 13): Defend your patent. Mock Courtroom. 10% of your final grade.
Pre-reading-week introduction to InteraXon.ca plus optional MannLab opportunities over reading week.

Reading Week, Feb. 16-22: Optional trips to MannLab Silicon Valley, MannLab Shenzhen, and MannLab Toronto + InteraXon for interested parties creating business activity + connections, etc..

Lecture 7 (Feb. 27): Visiting speaker, Chris Aimone, CTO of InteraXon.
Introduction: Birth of InteraXon in MannLab at 330 Dundas Street West.
Early and quick growth of InteraXon.
Introduction to the Muse 2, "The King of Wearables" (BetaKit), the #1 in wearables (PC Retail) and "the holy grail for mindfulness", ("Muse 2 review: The world's best meditation tech just got even better").
Muse 2 “Dutorial” (do-oriented tutorial).
How to create a business around mindfulness.
Assignment 4: Write a simple mindfulness app using the world’s most advanced BCI (Brain-Computer Interface). Create a simple “pitch deck” for your app.

Lecture 8 (Mar. 6): Present your app.

Lectures 9-12 (Mar. 13, 20, 27; Apr 3): Final projects.
Course summary.
Introduction to Rotman CDL and Y-Combinator.
How to win at CDL and YC.
How to form a successful startup.
Formation of companies for interested parties.
Opportunities at InteraXon, MannLab Canada, Silicon Valley, and Shenzhen.
Summer research opportunities.

IX. Academic Integrity

Each student in this course is expected to abide by the University of Toronto Code of Behaviour on Academic Matters. Any work submitted by a student in this course for academic credit will be the student's own work.

You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an e-mail, an e-mail attachment file, a diskette, or a hard copy.

Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Code can also be extended to include failure of the

course and University disciplinary action.

During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.

X. Accommodations for Students with Disabilities

In compliance with the University of Toronto policy and equal access laws, I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances, so arrangements can be made. Students are encouraged to register with Student Disability Services to verify their eligibility for appropriate accommodations.

X1. Inclusivity Statement

We understand that our members represent a rich variety of backgrounds and perspectives. The engineering department is committed to providing an atmosphere for learning that respects diversity. While working together to build this community we ask all members to:

- share their unique experiences, values and beliefs
- be open to the views of others
- honor the uniqueness of their colleagues
- appreciate the opportunity that we have to learn from each other in this community
- value each other's opinions and communicate in a respectful manner
- keep confidential discussions that the community has of a personal (or professional) nature
- use this opportunity together to discuss ways in which we can create an inclusive environment in this course and across the University community

Appendix. Available Course Equipment

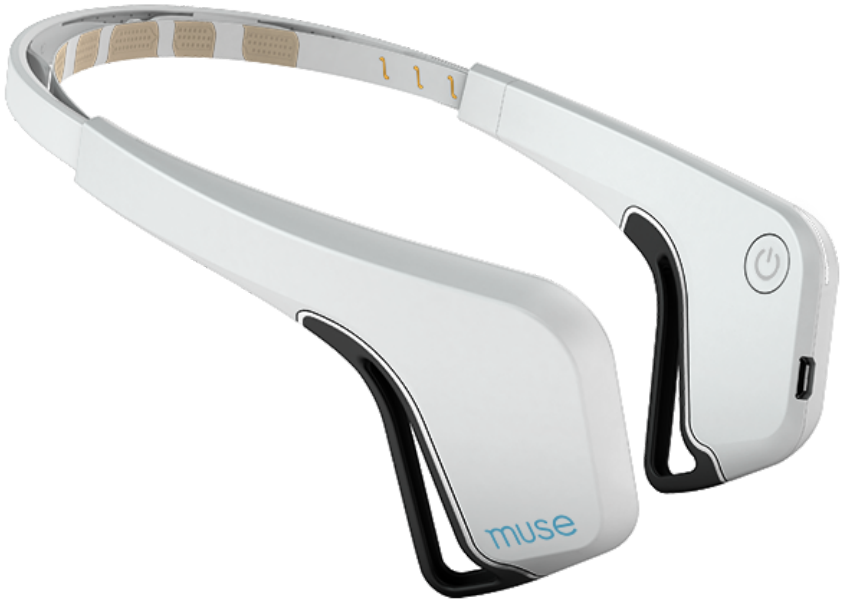
VisionerTech VMG-PROV

Related link: https://www.youtube.com/watch?v=T0m0qGA8xhk

Meta 2 Augmented Reality Eyeglasses

Related link: https://www.metavision.com

Muse Headband

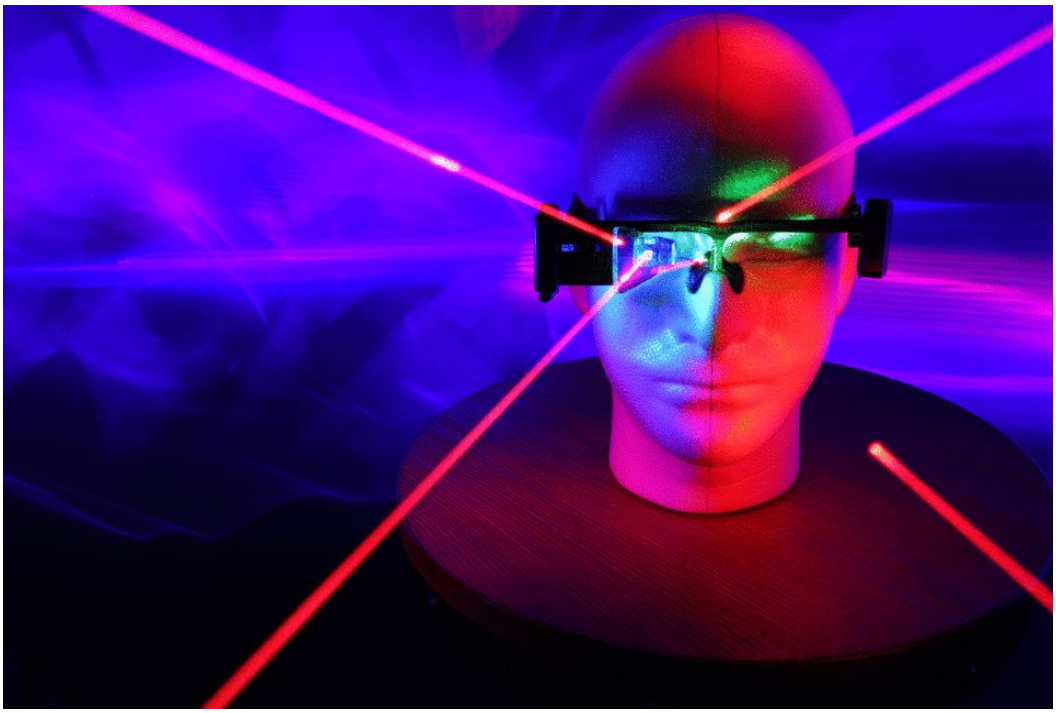


Related link: https://www.choosemuse.com

Muse Safilo Eyeglasses

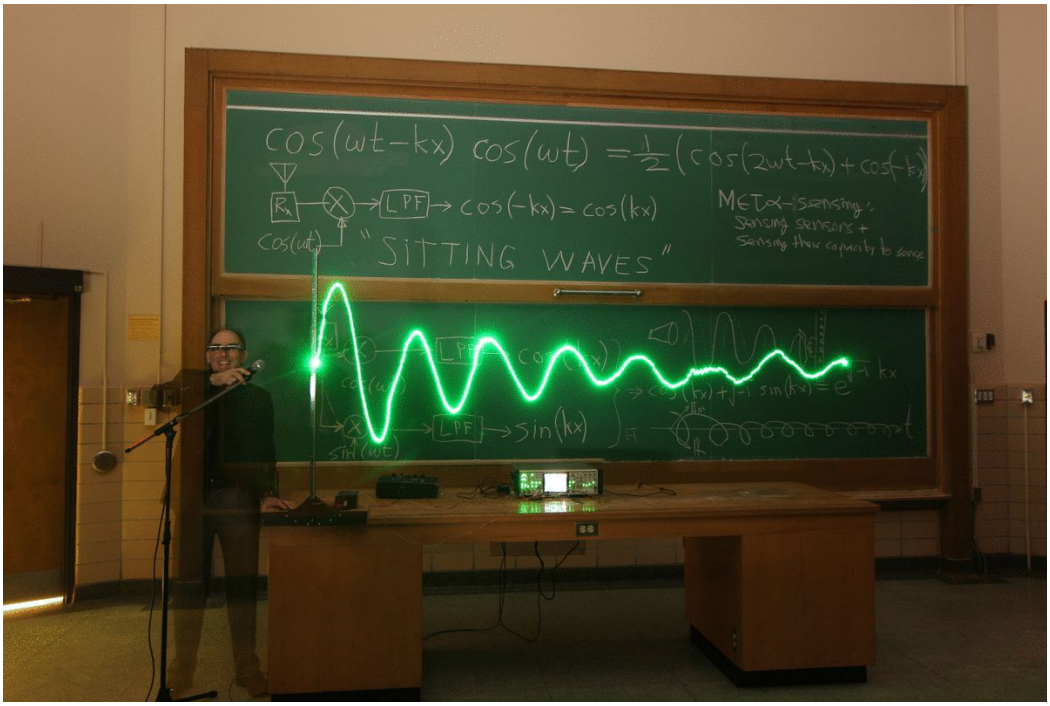
Related link:https://www.youtube.com/watch?v=5CZtoYbfbHU

Open EyeTap



Related link: https://www.openeyetap.com

“MannLab x SYSU” Lock In Amplifier & Phenomenological Augmented Reality



Related link: http://www.wearcam.org/par/