

MAS.S66: Electronic Products Design

Description: In this course we will explore what is required to bring an electronics product from concept to the consumer's hand. The main focus will be on small scale manufacturing and distribution, but larger scale techniques will also be discussed. Students will be required to design and build prototypes of their ideas, along with producing sales, distribution, and marketing plans.

Prerequisites: None. Although, as the class is very hands-on, enrollment will be limited to 12 students, with priority given to MAS graduate students.

Units: 12 (4-4-4)

Schedule: RF10-12, E15-341

Grading: The course is Pass/Fail. Students must complete all assignments and have a satisfactory attendance record. There will be a lab or problem set (50%) due each week, and a final project (50%).

Syllabus: Lecture topics, in sequence. Number in parentheses is number of lectures on that topic.

1. (1) Introduction - course objectives, structure. the design cycle. what is the value of an idea?
2. (1) Market analysis - what products are available, who buys them, how many get sold, what prices they go for, etc.
3. (2) Basic electronics - voltage, current, power. capacitors, inductors, resistors, diodes.
4. (2) Application specific information – these lectures will be determined based on students' product ideas, and will give background necessary to design within their chosen market space.
5. (3) Microcontrollers - available platforms, how to program them, limitations of common IDEs. digital communication.
6. (3) Mechanical product design - form studies, user interface design, user studies, mechanical prototyping, visual languages. sketching. ideation exercises.
7. (1) PCB layout - space usage, trace size, interference, ringing. various PCB types and board houses.
8. (2) Intermediate electronics - opamps, transistors, multipliers, filters,

oscillators.

9. (2) I/O - sensors, speakers, motors, LEDs, high power circuits.
10. (2) Sales and distribution - various scales of sales, marketing and promotion, funding models (bootstrap, crowd-source, VC, etc), product naming and differentiation, brand building, pricing strategy.
11. (2) Manufacturing - various scales of manufacturing. kits, part sourcing, in-house versus outsourcing, PCB assembly, interfacing with foreign manufacturers, lead times, cost reduction, DFM.
12. (1) Final project presentations.