

## Summary of findings for weekly computer lab survey in Mech 222; comparison between 2010 (2009W) and 2011 (2010W) offerings.

prepared by Warren Code, July 2011

There were seven computer labs in Mech 222 for each of the 2010 and 2011 cohorts. Lab 7 from 2010 was removed and a new lab inserted as Lab 4 for 2011. The other labs saw varying levels of revision, with positive results on the survey in almost all cases. The lab names are referred to below and in the data summary by shorthand names rather than by week they are offered (since that shifted for some labs) as follows:

**PointCloud:** Point Clouds

**CaesarBeard:** Triangulated Mesh Surfaces

**SurfInt:** Parametric Surfaces and Surface Integrals

**ThermoPlot** (2011 only): 3D Plotting of the Thermodynamic Surface of Water

**FluxBunny** (2010 only): Buoyancy and Flux Integrals

**BoatLab:** Freighter Parameter Estimation (uses data from physical lab)

**HillClimb:** Optimization by Hill-Climbing

**EngineOpt:** Engine Optimization

Overall findings across most or all lab weeks:

- ✓ Time reported spent on PreLabs and in completing the labs before their lab sessions were quite similar in both years.
- ✓ In 2011, students reported working together much more than in 2010 starting from Week 1; we may attribute this at least in part to more explicit encouragement to collaborate from the start of term.
- ✓ In 2011, students reported less dependence on the TAs help than in 2010.
- ✓ Perhaps due to the above, reported activity completion rates were higher in 2011 than 2010.
- ✓ Briefing Notes were rated as marginally more clear.
- ✓ Learning Goals were read and found useful at about the same rate overall.

---

## PointCloud

Schedule: Lab 1 both years.

Changes from 2010 to 2011: tightened up Briefing Notes, adjusted Activity 3.

Survey results of note:

- ✓ In 2011, the Monday group was told by the computer that they would have this lab on Thursday, so none of them were prepared in advance; this led to lower completion, nobody had done the prelab, etc.
- ✓ However the overall completion rates were about the same, indicating either the change to Activity 3 made the lab more accessible (though many of the Monday students did not get to it and had lower completion than the previous year).
- ✓ Already more teamwork; about 2/3 report working with others as opposed to 1/3 working with others in Week 1 of 2010.

Notes from lab:

- In this first week, many students struggle with writing functions.
- Difficulty reusing the work of `mcm_cloud.m` in producing `mcm_wireframe.m`
- When iterating over their wireframe, many students wrote loops up to  $N$ , not  $N-1$ .
- Challenge drawing a line in the animation (using `plot3d` with a 2-vector), though most could get the dot moving (just a set command).
- Instructor visited the (unprepared) Monday session, and noted: "I found many students quite lost about how to write a Matlab function, or how to use a vector to store stuff, or how to think about vectors, scalars, indexing, and all sorts of really basic things."

---

## CaesarBeard

Schedule: Lab 2 both years.

Changes from 2010 to 2011: new explanations in Briefing Notes, Matlab Learning Goals more explicit, adjusted activities to make more manageable.

Survey results of note:

- ✓ Significantly higher lab completion reported (and observed) in 2011, with more teamwork and lower TA dependence.
- ✓ Briefing Notes rated as more clear in 2011.
- ✓ Learning Goals rated as more useful in 2011.
- ✓ Self-reported increase in Matlab and Engineering skills higher in 2011.

Notes from lab:

- The new picture in the Briefing Notes illustrating the FACELIST idea was looked at frequently by students as they worked through the lab.
- Typo in Activity 4.1: want to test `n_ds` on triangle from PL2, not PL1 as stated.

---

## Surflnt

Schedule: Lab 3 both years.

Changes from 2010 to 2011: new explanations in Briefing Notes, Matlab Learning Goals more explicit, adjusted activities to make more manageable.

\*\*\* This lab requires revision; triangulation is a sensitive process and computations have behaved differently on different versions of Matlab.

Survey results of note:

- ✓ Teamwork similar on this lab for both years, but this is due to an increase in teamwork for Week 3 in 2010 (up to about 2/3 of students).
- ✓ Much lower TA dependence in 2011.
- ✓ Briefing Notes rated as more clear in 2011.
- ✓ Learning Goals rated as more useful in 2011.

Notes from lab:

- Much confusion with the pre-lab where an integral is calculated on the sphere.
- `makesphere.m` gives quite different results due to a version difference in the `delaunay()` triangulation function.

---

## ThermoPlot versus FluxBunny

Schedule: ThermoPlot new as Lab 4 in 2011, replaces FluxBunny (Lab 7 of 2010)

Survey results of note:

- ✓ More time spent on ThermoPlot PreLab (average over two hours) than FluxBunny (average less than 1.5 hours).
- ✓ More lab completed before session for ThermoPlot.
- ✓ Much higher completion rates for ThermoPlot (FluxBunny acknowledged last year as too long).
- ✓ Higher rate of collaboration for ThermoPlot, though the nature of the activity was also much more collaborative (students working in teams).
- ✓ Lower TA dependence for ThermoPlot, as per the other 2011 labs.
- ✓ Briefing Notes for ThermoPlot rated as more relevant and clearer than those for FluxBunny.
- ✓ Learning Goals for ThermoPlot rated as more useful.
- ✓ Matlab and Engineering learning both rated higher for ThermoPlot (Math learning rated same for both).

Comments:

Some of these effects related to weekly work could be the result of the different study schedule for the middle of term versus the busier end of term.

Notes from lab for ThermoPlot:

- lots of confusion on the plotting scales;  $\log()$  is base e, not 10 (gives very specific scale issue in plot)
- not sure if  $\log\log()$  was mentioned or not; doesn't really help with 3D plotting
- Saw some loop issues – students wanting to assemble a vector  $v$  but put  $v$  in the loop, not  $v(i)$  when assigning scalars (here  $X_{steam}$  took scalar data only)
- Had second TA (a tutorial TA) to help with the foam management.

---

## BoatLab

Schedule: Lab 4 in 2010, Lab 5 in 2011.

Changes from 2010 to 2011: new explanations in Briefing Notes, Matlab Learning Goals more explicit.

Survey results of note:

- Lower lab completion prior to lab, and lower lab completion overall.
- ✓ One group of students had data collection problems, which would have affected their work prior to the computer lab time.
- ✓ Teamwork higher; only 6 students in 2011 reported working alone, versus 39 in 2010.
- Briefing notes rated as less clear in 2011.
- Learning Goals rated as less useful in 2011.
- Lower self-assessed Math and Matlab learning in 2011.

Comment:

This was the favourite lab of 2010, but it may have been spoiled for the 2011 students where the physical lab did not work out (their data collection was unsuccessful); this could account for the more negative response.

---

## HillClimb

Schedule: Lab 5 in 2010, Lab 6 in 2011.

Changes from 2010 to 2011: revised the stated Matlab Learning Goals, minor revisions.

Survey results of note:

- ✓ TA dependence lower in 2011.
- ✓ All other items statistically the same in the two years.

---

## EngineOpt

Schedule: Lab 6 in 2010, Lab 7 in 2011.

Changes from 2010 to 2011: minor revisions.

Survey results of note:

- ✓ TA dependence lower in 2011.
- ✓ Learning Goals rated as more useful in 2011 (despite no alterations).
- ✓ Self-assessed Matlab learning a bit higher in 2011.

Comment:

Lower response rate in 2011 could be due to this being the final week; could skew the two above items a bit higher.

Notes from lab:

- Some continuing needing to be careful with loglog plotting, but this was not a roadblock like the earlier week involving such plots.
- One student used  $\text{mean}(Q_{\text{list}})$  to find  $\bar{Q}$ , the average heat. This is erroneous as  $Q_{\text{list}}$  is defined on the interval  $-\pi$  to  $\pi$  but not at uniformly-spaced points; a function average is needed involving an integral.
- log plotting is revisited here - should be an overall learning goal perhaps?