Students in Cluster 2 hit the ground running in week one with the development, construction, and analysis of their first assignment - a working mechanical pendulum clock! Lessons and lectures are given by both Professors Delson and de Callafon, teacher fellow Bryn Bishop, and our awesome TAs Jackie and Jayant. Here are some things the students had to say:

Monday - The first day of class was an amazing experience. It started off with a presentation about safety and labs, and then we met with our professors, which are Professor Delson and Professor de Callafon. They talked about their lives and their research, which was interesting to hear because it shows us that we are able to do those things as well. From there, we were introduced to our first project, which is creating a pendulum clock. We also discussed teamwork, which is an important part in our second project. After lunch, we were separated into two groups. My group went to a different room where we learned how to construct our pendulum using bolts and a sheet of acrylic. Afterwards, we went to a computer room where we created a model of a part of the pendulum using computer software named Inventor. - Janica Mendillo

Tuesday - Today, we went to our first discovery lecture and learned about invisibility cloaks from professor Kante, a guest from UC Berkeley. We learned how our eyes perceive the world around us and the physics behind light. Today we finished up some major components of our pendulum clock (with some special touches of our own). For lunch, we went to a different cafeteria from the usual, which was far superior than the last. - Brend Meng

Today, my cluster and I were privileged to listen to a Discovery Lecture about light, optics, and the development of light bending technology. In class, we continued building clocks and finished up the design of brackets to support our clocks. We finished up the day with a delicious dinner at the Canyon Vista Dinning hall. - Aaron Nhan

Wednesday—COSMOS has been different than anything I would have ever imagined. People have told me that it would be so much fun and that I would also learn so much. But in my opinion, COSMOS has been so much more. The friends I made and the things I learned will be something that I will always treasure. For example, today, we learned about the physics behind the pendulum and how to use a program called "Work Model 2D" to test out possible working models before building them. In addition, we spent the day learning and applying CAD (Computer Aided Drafting) concepts to parts of our clock. In the end, I am delighted to say that I never thought I would learn so much and have so much fun in just three days. - Terry Xiang

Today we continued to work on our clock pendulum projects by designing the major components on a 3D designer software called Autodesk Inventor and also learned how to use another software called Working Model 2D to model real life simulations in the two dimensional field with basic physics properties like moment of inertia. With the Autodesk Inventor we CADed (Computer Aided Designed) our own pendulum designs that we sketched and drew ourselves. For example some people designed Pokemon as their pendulums while others used animal heads as their pendulums. Using arc tools, line tools, or constraint tools, most people were able to finished completely modeling their pendulum on the software. Some were even able transfer their design into the $100,000 Lasercamm to laser cut their pendulum out of acrylic material. Besides laser cutting, many of us were able to 3D print a part with the MakerBot for the clock project. With Working Model 2D we learned how to simulate real life scenarios like dropping a ball and bouncing it on the ground or rolling a ball down the ramp. It’s really interesting how you can project how your situation will turn out without actually performing it in real life. You can even speed up the process or make it slow motion to visualize every detail. Overall it was a fun packed day of learning and using new software. I’m looking forward to completing the clock project during the next few days! - Austin Hwang

Thursday and Friday—The rest of the week, students are finishing up their clocks using a bracket that they designed individually and 3D printed, an escapement wheel and pendulum cut with Lasercamm, and parts students machined in the shop. This entire project will be finished and students are currently creating websites to show their clocks and results. The websites aren’t due to be finished until next Tuesday, so I’ll include instructions on how to view your student’s clock webpage in the NEXT newsletter.

COSMOS has been so much more. The friends I made and the things I learned will be something that I will always treasure.
CLUSTER 2: ENGINEERING DESIGN AND CONTROL OF KINETIC SCULPTURES

https://sites.google.com/a/eng.ucsd.edu/kinetic-sculpt/home/teams

Now that students have all individually created their clocks and have at least the same baseline of skills in the machine shop as well as the computer lab, students started this week off forming teams. You can see your student’s teams by go to the course website. They will work in these teams and on their websites for the rest of COSMOS. Dr. Delson started the week off with the first design challenge for teams which was a water balloon drop. Monday—Water Balloon Project: Students had only a few hours as a team to work together, design, build, and test their water balloon structure that is dropped. The best drop survived 8 feet! Two GoPros were used during the tests for students to analyze the strengths and failures of their structure.

Today was our water balloon project day and it was stressful yet productive. In the morning, Dr. Delson spoke to us about teamwork and the water balloon project before we started building our contraptions. As soon as we got to the design studio, teams began to discuss and prototype. After numerous drops and analysis through the GoPro, many teams managed to successfully drop the balloon from at least 4 feet without breaking. -Tiffany

Following a balanced weekend of recreation and academics, cluster two started the day with a review of team management and principles. Following a review of guidelines and material constraints, we broke out into teams and started brainstorming designs for our water balloon drop. Once our design was completed we tested it and made the necessary improvements. After lunch we made the final iterations and tested the design at 2, 4, 6 and 8 feet. Finally all teams were responsible for completing a lab presentation. -Estelle

Tuesday—We started off with a Discovery lecture from Dr. William McGinnis; McGinnis spoke about the human genome, the genetics of other animals, evolution, the future of genetic technology, and his participation in fruit fly genocide. After his speech the Clusters’ days deviated from each other. As a member of Cluster 2 the meant going to the creatively named Engineering II building to work on our Kinetic sculptures and giving water balloon presentations. This meant a couple minutes of presenting, followed by an afternoon of panic considering the Ethics essay is due. Cluster 2 tried to drop a ball straight down to measure its speed to prove the relationship between Potential Energy and Kinetic Energy. Cluster 2 working on either their CAD or their analysis for their clock. Slowly students trickled out of the computer lab, and went to the dorms until the last group of four students, including yours truly ran back to make it before check in. The programs included Cereal and Cartoons, Open Mic, and Love Languages. I know the Cereal program played the Spongebob Movie, and Open mic had some poetry reciting, but I have yet to know what Love Languages was about. Though this day sounds extremely busy, it’s just an ordinary day at COSMOS. -Bryce

We practiced scientific communication by presenting our PowerPoint’s on our water balloon projects with our teams. We were nervous because it was our first presentation, but we got a lot of good feedback from the teachers and other students. We then learned about the physics behind freefall to prepare us for our lab that followed shortly. We had fun doing the lab and learned a lot while doing it. -Gabriel

Wednesday—Today we learned the RobotC language to program the Lego NXT module. Our tasks were to achieve the four functions: able to control the basket to run back and forth, the speed of the basket, the number of times it runs, and a user interface. I had some previous programming experience, and finished the first three tasks quickly. However, I still encountered some problems because I learnt computer science in Java, and it is very different than RobotC. Anyway, I and my partner Paul learnt a lot today about both programming and robot control. I look forward to doing our final project. - Hongyi

Thursday & Friday—Students are now programming in RobotC working in pairs on challenges created by the Professors. They have had a few challenges so far, and some will receive a surprise on Friday for winning a challenge! On Friday, the teams will begin to design and build their mini sculptures.
Cluster 2: Engineering Design and Control of Kinetic Sculptures

Daily life this week has been a balance of lectures, designs, tests, risk-reductions, and fabrication. Dr. Delson and Dr. de Callafon have been increasing the technical components and diving into more advanced topics. Some students saw derivations and calculus for the first time as they learned how sine and cosine functions and dynamics of oscillations are intricately related. Students were also introduced to Degrees of Freedom and good designs for bearings. This week, students continue to work on their mini-sculptures, risk reductions, and team webpages located here: https://sites.google.com/a/eng.ucsd.edu/kinetic-sculpt/home/teams. We also had a wonderful field trip to Solar Turbines and Belmont Park on Wednesday.

Monday During Dr. Nelson's lecture, we learned about the utilization of velocity and force, as well as the relationship between the two. We were given a sea-saw analogy in which we learned that the greater the mechanical advantage we were obtained, the less advantage in velocity we had. In addition, we also listened to his lecture about bearings, in which we learned about different levels of friction and precision. Through this lecture, we are now able to apply such knowledge to our sculpture project, as we have started 3D printing parts and incorporating motors to our structures. -Ashley

Tuesday For the past two days of this week, our cluster has been starting on our kinetic sculptures for our final project. The project requires every group to design and build a kinetic sculpture out of PVC pipes, tracks, connectors, and objects that we create in Inventor and 3D print or Lasercam. We started off on Monday by taking a sculpture that we created at the end of the previous week and rearranging objects into the designs we want. It was mostly a day to work on revising our designs and picturing how we would be able to implement them into one project. On Tuesday, we continued to work on our sculptures. Some groups started to code and create robots for parts of their sculpture. In addition, we listened to a lecture about the degrees of freedom of an object as well as good ways to use bearings. It has been a rather busy two days, to be followed to a field trip on Wednesday and a risk reduction test for our sculptures on Thursday. I, personally, am looking forward to delving deeper into these topics and seeing how our sculpture will turn out in the end. -Erica

Wednesday Today was a fun-filled day of activities. We went on a field trip to the company Solar Turbines in the morning and spent time in the afternoon at Belmont Park. At Solar Turbines, those of us who didn’t wear long pants because it was a hot day weren’t able to go on the tour. Therefore, we sat through a couple of presentations in the conference room regarding some of the work they do at the company. They mainly focused on the mechanical and engineering design portions of their work. After eating our boxed lunches, we took the bus to Belmont Park! Everyone had a great time on the rides, especially on the Big Dipper, which was a roller coaster made primarily out of wood... quite uncomfortable but really fun! A group of us also enjoyed fattening portions of ice cream from Sweet Shoppe before we left. Overall, it was a productive yet relaxing day. -Tiffany

On Wednesday the twenty seventh at 9:15 cluster two boarded a bus to a Solar Turbines faculty. “Headquartered in San Diego, California, USA, Solar Turbines Incorporated, a subsidiary of Caterpillar Inc., is one of the world’s leading manufacturers of industrial gas turbines, with more than 15,000 units and over 2 billion operating hours in over 100 countries” (Caterpillar | Solar Turbines). A group of student were able to get the tour of the floor faulties and assembly area. Whereas a majority of the class were given an oral presentation. After learning about the machine’s, control and packaging of the turbines our class boarded the bus again. Our afternoon was spent at Belmont park gaining first hand experience with kinetic sculptures. Your cluster spent quality bonding time observing the effect of kinetic machines and phics by riding multiple roller coaster and amusement park rides. -Estelle
Can you believe it Week 4 already? This week has been absolutely wonderful as we watch the final projects and presentations come together. This week can be summed up eloquently with Dr. Nathan Delson’s paraphrase of Tom Cargill's words: The first 90 percent of a project accounts for the first 90 percent of the development time. The remaining 10 percent of the project accounts for the other 90 percent of the development time.

The past few days have been, truthfully, a little hectic. Along with a Discovery Lecture, the final week has also become the final stretch of building, fixing, and beautifying our final projects, our kinetic sculptures. Each team manages differently. One has finalized the implementation of their Pokemon concept on their sculpture. Another is experimenting with structure placement for safety purposes and ease of movement. Mine is busy doing two of our three main points to perfect the user interface and embellish our sculpture. While some are busy doing one thing, other members are helping out in another area. At the same time, we are creating presentation materials to officially finalize the sculptures. One of which is a poster. Another is the presentation slides. As a grand finale, we will soon begin to prepare for oral presentations for our best chance to display the fruits of our efforts these past few days (and week, considering everyone included our mini sculptures in our full structures). This is the full demonstration of the software, engineering, creativity, design, and teamwork skills we’ve learned and accumulated from day one of our COSMOS experience. And I can proudly say, it was worth it. - Zhifei (Kary)

This week at COSMOS our cluster is finishing up our final projects. Our final project will consist of our working sculpture a poster board and an oral presentation with google slides. We have been working on the final project for nearly two weeks and many of the groups are on the final stretch. We are learning a lot of new programs and skills in this project such as teamwork that will help us in the real world. - Paul

This week in design and control of kinetic sculptures we worked in our groups on building our final projects. My team, the Grape Team, 3D printed and laser cut parts, coded Lego NXT Robots and installed our mechanical parts and tracks. As we go into the final stretch, my team looks to finish our oral and visual presentation and fine-tune our sculpture to limit error. - Owen

Wednesday, August 3. Three days until we present our final projects. I got up early at 6:45 to run around the green. Most of the teams got up early, too, to eat and get to class early to work in the design studio. My team now consists of only me, Tiffany, and Vittal, because Matthew left for medical reasons. With one less person, we had to rush to finish our motor arrangements and the interactive portions. We had already coded most of the RobotC programs we needed, but we still had to troubleshoot with different colored balls and their different thicknesses. A funny problem several teams ran into today while testing their tracks was not having enough balls to put on the tracks, so multiple people ended up running around the design studio looking under chairs and behind doors. Of course, there were more, but we just forgot to ask the professor. Lesson of the day: ask for help. In the afternoon, we had cookie decoration, basketball, human chess, and painting for programming activities. My suite ended with baking cookies together for a yummy late-night snack. - Zhixue (Mary)

We are looking forward to showing you all that we have accomplished these past four weeks! Thank you for your support!