Douglas Kaiser (dtk42)

Mechanical Engineering Major

ASML, fall 2014

Co-op Work Assignment

This past fall I worked as an intern at ASML Holding, a lithography company. I worked on the analysis team in Mechanical Development at ASML’s Wilton, CT office. The team used a variety of sophisticated software packages and analytic techniques to provide engineering applicable answers to teams in MDev who needed simulations run or other analysis work completed. Because of this, the projects being done were often unrelated to one another, but the tasks I worked on were all related to the same project.

My job was to simulate low pressure flows in an extremely clean vacuum environment with various gases and boundary conditions. These flows were often going through an optical environment, which required the mitigation of contaminates, and a changing environment, due to the mechanics of the system. My analysis took me from simple steady state network flow models using in-house software run through the Windows command window and batch files, to a python network reduction script and error analysis of models, to a reduced dynamic model in Simulink. While work was progressing on this large project, I had smaller tasks to complete on the side. This included prototype testing in the lab and a flow model analysis that was an exercise in simulation accuracy and error tracking across multiple methods.

ASML has many online resources for introduction and training to get you started. The most interesting resource I found was an overview of the older products the company made when it was founded in the 80’s because it showed the history and progression of the company. Most applicable training occurs on the job one-on-one. When training involves a big piece of software or update it is done in large groups in the cafeteria or in conference rooms.

My mentor was very helpful and I felt that I could go to him with questions, but it took some time to get to that point.

Assessment of Learning and Development
While I am still not sure what I would like to do in my engineering career I found the work at ASML enjoyable and very interesting. I found much of the work to not be technically challenging as I have worked on simulations like these and the theory behind them in the class room before. The real challenge was in connecting what I already knew to the tasks I was given.

A big take away from this past fall is how to better interact in a professional environment. This includes little things like what is appropriate to wear in an office to bigger things like how to develop a good rapport with someone and how that can make technical work easier and go faster no matter how difficult the work is. If I could go back and do it all over again I think I would try and approach challenges with more confidence.

Life Out-side of Co-op

ASML does not provide housing for interns and unfortunately the surround town Wilton is very expensive so you may need to look elsewhere for a place. I lived in an apartment building in Norwalk just south of the office. But it is not a very friendly town and there isn’t much to do, but luckily NYC in just an hour away by train. Be prepared to travel on the weekends as there is very little to do in the area. To this end you may probably need a car.

Evaluation

The best feature of this job is the interesting work I was given and the professional environment. This was the first time I was in such a professional workplace and I feel like I learned a lot. On the analysis team where many of the members are engineers with many years of experience at various companies I feel like I learned from them and their perspectives.

One of the worst features of this job was living in such an isolated place. Perhaps it is the perfect environment for full employees with families and homes nearby but I found myself bored. But I suppose this isn’t a real issue for some people.
Douglas Kaiser (dtk42)

Mechanical Engineering Major

ASML, summer 2015

Co-op Work Assignment

This past fall I worked as an intern at ASML Holding, a lithography company. I worked on the analysis team in Mechanical Development at ASML’s Wilton, CT office. The team used a variety of sophisticated software packages and analytic techniques to provide engineering applicable answers to teams in MDev who needed simulations run or other analysis work completed.

My main tasks this summer related to ensuring an accurate overlay of the lithography system across multiple passes of the laser system. Accurate overlay is vital to the quality of the laser etching on a silicon wafer. One point of overlay error is in inaccuracies of the reticle alignment system. My task was to assist an engineer in assessing how the reticle may be deformed due to heating over time and thus affecting overlay.

The first portion of this work was to work with a large ANSYS model of the reticle and its support system and see how the whole of it responded to thermal loads. I worked on how to reduce the size of the model without sacrificing accuracy and I was able to identify a few regions which required refinement. The second portion of my work revolved around the actual thermal deformations of the reticle and how the machines computer could correct for any distortions that the deformed lens would create. To do this I needed to learn about and apply a shape decomposition method that can be thought of as a step-up from a Taylor Series or a step-down from Zernike Polynomials. I created five different techniques in MATLAB to accomplish this, all with varying levels of success; the final two proved to be very accurate.

Training was provided on multiple occasions in different software packages, notably there were three days of Star CCM training and three days of off-site ANSYS training. I also took some time and helped the engineer who I worked with in the fall wrap up some documentation of my previous work.
Life Outside of Co-op

Life outside of the co-op was similar to last fall. Housing was difficult to get and I ended having to rent from the same place as last time; an overpriced apartment in Norwalk. A car is necessary in this area as nothing is within walking distance and public transportation is nonexistent for any destination not in NYC. Luckily this summer I had other interns to hang out with in and out of work, this was a huge improvement from the fall when the lack of people my age was the main detractor from my experience.

One of the highlights of the summer was the Techno Challenge that a couple of the managers organized for the engineers. I joined a team of other interns and a new hire and we were given a Lego Mindstorm set with which to build a maze solving robot. It was a great bonding experience for me and the other interns and provided a great outlet on weekends when I didn’t travel.

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ASML makes Lithography machines – machines the size of semis that make the chips that go in electronics. For my working group, the technical function is the design of the next machine planned that will improve on the functionality of the previous machines. Specifically, I worked on the new cooling system that would help increase the number of chips that can be printed within a certain amount of time.

My projects this summer have been working on analyzing the flow network of cooling water for some of the motors in the machine and designing a traditionally manufactured back-up air nozzle for the small possibility of the planned 3D printed nozzle not working out. The complicated network of ducts, pipes, manifolds and fittings for cooling water underwent many changes, and we needed to perform analyses on pipeflow software to provide confidence that the new system would meet flow and balance specifications. After taking many measurements on the existing water cooling system and making alterations to the flow analysis to reflect the measurements, I analyzed the probable flow behavior of the new system and made changes to reflect the alterations. The nozzle for cooling air is an intricate part that is 3D printed, or additive manufactured, out of titanium. In the slight possibility that the printing process would cause unknown issues dues to the relatively new technology involved in 3D printing titanium, I explored options for other production methods, such as brazing and welding, and created designs for each in CAD. The back burner project for any down time that I had was researching and planning tests on the thread strength of additive manufactured titanium.

ASML places a large emphasis on training, with many onsite training sessions and online tutorials for all aspects of work. Team members are also very helpful, and everybody is willing to spend some time explaining their answers to questions and recommending readings and people to talk to for more information. The second term definitely had a shorter on-boarding time. I was not assigned a formal mentor; however there are many people in my group that I feel comfortable asking for guidance, including my supervisor. The projects that I worked on were very relevant to my educational background and career interest. A lot of what I’ve learned in classes has been very useful, especially fluids concepts. I found what I was looking for in a co-op
experience, and appreciated working on projects where there is a tangible output and being able to see how my contributions to the project are meaningful. I learned a lot about how projects move toward completion and production in engineering that classes have alluded to. After learning so much about the semiconductor industry here, I have a renewed interest in industry and have found an area that I did not know I was interested in before. I have also gained further appreciation of keeping in mind the larger timeframe of when things need to be done by – at a scale much larger than even on project team at school – and the importance in communicating so that people know what you’re working on and that you stay in the loop for what needs to be finished. The only thing I would possibly do differently would be checking in more often with my progress, rather than trying to perfect everything, since I have received valuable input that might have saved time if I had asked earlier.

Housing is an adventure. ASML recommends Fairfield University for housing during summers, but is not ideal because of traffic. The important thing to remember for the area around Wilton is that most of the traffic in the mornings is heading into NYC and heading away in the evenings. The best place to live would be somewhere between NYC and Wilton. I recommend looking into places in Stamford or Norwalk, especially because they are more urban areas with more things to do. For both terms, I rented a room in somebody’s house. I found the place this summer on the recommendation of my landlady from last fall. I found the place last fall on craigslist and got very lucky that it was a nice place. I can’t emphasize enough how important it is to go see the place in person and to look up the person renting out the place online. I would recommend a car because the area is mainly suburbs, but there is a bus stop right outside ASML, so relying on public transportation is possible. I enjoyed myself outside of work too, and made quite a few friends in the company that I hang out with after work. I also had many friends interning in NYC over the summer, so I took the hour long train ride to Grand Central most weekends. ASML has many groups, like a golf league, and also does outreach programs as well, such as visits to local schools. I ended up going to yoga classes with some co-workers because ASML does have a deal with the local LA Fitness. There are also company events, such as the tech conference and 30th anniversary of the company, that are fun to go to.
Overall, I loved the variety of my work between testing, analysis and design work. Although there were times when getting testing supplies and test time were difficult, like at any large company, I had a very positive experience and would definitely recommend the experience.
Donnelly Carroll (dmc355)
Mechanical Engineering
ASML Holding
Co-op Student Spring and Summer 2015

Job Summary

Co-op Work Assignment

I worked in the Analysis Group within the Mechanical Development Group at ASML. The analysis group is comprised of engineering analysts who specialize in different topics and software. Each analyst works with on projects with different development and design groups, depending on the demand for analysis work. As a result, each analyst is always part of the analysis group, but is also assigned, temporarily, to various project teams.

As a co-op student in the analysis group, I worked on three different projects in three different analysis areas. My first project was to compare two sources of temperature data, one from temperature sensors in the machine and another from a LiveTemp experiment in order to determine a way to mathematically apply thermal corrections to the machine data so that the readings were more accurate. The second project I worked on was simplifying a component assembly in order to create a simpler but mechanically accurate FEA model. I worked on simplifying subassembly geometries and creating artificial material properties so that the simplified geometries behaved in the same mechanical and thermal way as the full components. The third project I worked on was a state space model of a different machine component in order to couple the physical behavior of the model with the Simulink model used by another group to predict the dynamics of the system.

There were numerous opportunities for training in software packages, machine function, and company policies. I found the online tutorials provided by ANSYS and Siemen most helpful to improve my capabilities in ANSYS and NX. I had the opportunity to attend multiple trainings onsite in Design Simulation, Matlab, and COMSOL, as well as weekly opportunities to attend webinars in ANSYS and COMSOL. There is a very thorough online competency page, which I used to learn more background on my specific projects. Additionally, other engineers were extremely generous in lending me textbooks and other materials to learn from.

My mentor was awesome! She was extremely knowledgeable about all the various projects and exceedingly competent in the software packages. I always felt comfortable approaching her with questions and she was very thorough in answering them and was engaging in her explanations. What I appreciated the most about my mentor, is that she would frequently stop by and check in on me and my progress and genuinely seemed interested and in tune with the work I was doing and the progress I was making.

Assessment of Learning and Development

My work activity at ASML was a good extension of my coursework experience from Cornell. I really enjoyed continuing to work with a few software packages that I had been introduced to at Cornell, but had not had too much experience with. I especially enjoyed working in ANSYS and learning NX and COMSOL. I found that working in the profession of engineering required me to recall on knowledge I had from coursework, but was not practiced in using every day.

Besides the direct engineering tasks I was assigned, my co-op experience has allowed me to learn about the professional culture of engineering. As a student at Cornell, I had a few opportunities to work collaboratively on engineering coursework, but I had most of my experience working in groups and
learning about team dynamics and interpersonal relations in my extracurricular activities. At ASML, I had
the opportunity to work directly with individual engineers as well as collaborate with various technical
engineering groups. Specifically in my immediate group of analysis, I learned the most about
professional skills from my group lead. I really enjoyed attending the weekly group meeting and was
able to observe the various ways in which my GL promote team unity in the Analysis group. I noticed
that my group had individuals with very different and sometime conflicting personalities, but the GL
actively worked to reinforce group collaboration. I specifically observed how he moderated group
discussions, allowing individuals to speak then he repeated a summary of their points to the group to
ensure all group members were on the same page. I also enjoyed participating in the group offsite event
and observe how it facilitated professional development.

Life Out-side of Co-op

I was very fortunate to be able to live at home during my co-op experience. My office was only a
fifteen minute drive from my house, but I definitely needed a car for transportation. I really enjoyed the
gym I joined, right down the road from ASML and I also worked as an AP and SAT tutor. I also joined the
ASML climbing group, which meets every Wednesday at the local climbing gym and plans weekend
outings.

Evaluation
The best feature of this job was the support I received from other engineers in my group. I really
appreciated how individuals reached out to me throughout my whole co-op experience, not just at the
beginning, to check in with me as see how my work was going as well as how I was enjoying my
experience. Technically, this job offered an incredible opportunity to work in a variety of engineering
areas; I specifically enjoyed working in both thermal and structural analysis.
The worst feature of this job is the location. Fortunately, I had a wonderful living situation, but
found it difficult to find other young professionals in the area, and had to allocate a good amount of
travel time to drive to activities after work.
Kyle Darling (kgd28)  
Mechanical Engineer  
Summer Co-Op at ASML  

During my summer term at ASML I worked on another sensor based project. The objective of this module was to measure the accuracy of the micro-chip manufacturing process at the nanometer level and make corrections to future batches of chips. I worked with the mechanical development team, whose job it is to design and analyze the frame and mounts within the unit. I worked on three main projects during my ten weeks: engineering drawings of optics, modeling of cable routing paths, and design of sensor covers.  

I worked with many types of engineers during this session including mechanical, electrical, optical, industrial, and manufacturing. This type of cross sector involvement helped to build communication skills as well as increased my understanding of how many people it takes to produce quality engineering work. It was interesting to see the design considerations that other departments have. Within my group I did not have a formal mentor but I had a team leader and team architect who were very helpful in answering questions or pointing me in the right direction. I also received direction and advice from team members that I worked closely with.  

Unlike the fall term when there were just two co-op students, during the summer there were 12 new interns. Initially I thought it would be nice to live with other interns or hang out after work but ultimately that did not work out. Many of them drove to work with their parents so they didn’t have a ride home if people wanted to do something after work. The other half of the interns lived in all different directions due to lack of housing in the area, so there was never a convenient place to meet up; affordable housing near Wilton is not easy to come by. To find summer housing I posted on Facebook, hoping a friend would have an extra room in the area, and got lucky. I lived with a friend of my family who happened to be in Wilton. I had bad luck with housing on Craig’s list during the fall and was very glad to have found this place. I would suggest starting to look for housing early through friends (and friends of friends) and family, and then moving to Craig’s list and other places. A bunch of people lived at Fairfield University but that was about a 45 min drive with traffic. If you don’t have a car, Norwalk seems to be the only town that the bus goes through.  

Outside of the office ASML offers a pick up soccer game, softball team and golf league. They also have opportunities for volunteering through a middle school program called ASML for kids and through local charity fundraising events. To fill my time outside of work I played ultimate Frisbee at a pick-up game twice a week and joined the local gym. On the weekends I went home or met up with friends in Pennsylvania. ASML is only about an hour train ride from NYC, so I also took trips there to visit friends.  

One of the big takeaways from this experience is being able to work productively with many other engineers. Gaining a better understanding for the collaborative environment of engineering is a skill I can take with me anywhere. I was able to work on
interesting projects across several different areas such as technical writing, experiment
design, data analysis, and CADD modeling. I do not think I would have had such
breadth if I had done an internship instead of a Co-Op. The less enjoyable part of my
coop experience was finding housing. This is not something that ASML has much
control over but rather a function of the area. Also it would have been nice to have a
bigger sense of community among the intern and co-op students.