Providing ME Students Opportunities to Enroll in Law School Courses

Dr. Matt Gordon P.E., University of Denver

Dr. Matt Gordon is Professor and Chair of the Department of Mechanical and Materials Engineering. His research areas include numerical and experimental plasma physics, chemical and physical vapor deposition, electronic packaging, and bio-medical engineering. He has supervised to completion 26 MSME students and 5 PhD students. Publications include 1 book chapter, 32 journal publications, 47 refereed conference proceedings, 29 non-refereed publications, and 27 non-refereed presentations. He is responsible for funds as PI or Co-PI from 52 separate proposals totaling almost $6,500,000. Courses taught include undergraduate finite elements, thermodynamics, fluid dynamics, heat transfer, and engineering economics and ethics, and graduate finite elements, numerical methods, thermodynamics, statistical mechanics, plasma fundamentals and gas dynamics.

Bradley Davidson, University of Denver

Dr. Bradley Davidson is an Assistant Professor in Mechanical Engineering and director of the Human Dynamics Laboratory at the University of Denver and Clinical Assistant Professor at the University of Colorado Anschutz Medical Campus. He holds a BS in civil engineering from Tennessee Tech, an MS in engineering mechanics from Virginia Tech, and a PhD in biomedical engineering from the Virginia Tech–Wake Forest School of Biomedical Engineering and Sciences. His research focuses on understanding and characterizing human movement across healthy and pathologic populations through in vivo experimental measurement and musculoskeletal modeling. Applications focus on fall prevention, spine stability, rehabilitation after total joint surgery, and muscle coordination and proprioception in the lumbo-pelvic region.

Prof. Corinne Shirley Lengsfeld, University of Denver

Dr. Lengsfeld serves as the Associate Provost for Research and holds a tenured faculty position at the rank of Professor in the Department of Mechanical and Materials Engineering at the University of Denver. As Associate Provost has oversight of the Office of Technology Transfer, Office of Research and Sponsored Programs, the Center for Statistics and Visualization, the Center on Aging and serves as the Institutional Officer. She received her bachelors, masters and Ph.D. degrees from the University of California at Irvine in 1992, 1993, and 1997 respectively. Her research specialization is in the interdisciplinary research of meso and micro-scale fluid systems. Her work has included investigation of biopharmaceutical delivery and processing, inhaled aerosol and deposition and optimization of complex fluid systems. Her work has been cited 628 times by more than 242 articles resulting in a web of science H-index of 14. During her 13 years at the University of Denver she has received over $4 Million in external funding from agencies like NSF, DHHS, DOL, DOD, State of Colorado, Keck Foundation as well as a mix to foundations and corporate contracts. Dr. Lengsfeld serves as Editor-in-Chief for the journal Atomization and Sprays.

Prof. Bernard Chao, University of Denver Sturm College of Law

Bernard Chao joined the University of Denver after practicing law in Silicon Valley for almost twenty years. Professor Chao teaches patent and intelletual property law. His research focuses on patent issues involving the hi-tech industry. Some of the issues he has written about include: the rules for determining when software is patent eligible, patent remedies, the extraterritorial reach of U.S. patent law (particularly as applied to the semiconductor industry) transparency in patent litigation and cognitive bias in jury decision making. Professor Chao received his J.D. from Duke University and his B.S. in Electrical Engineering from Purdue University.

Providing ME Students Opportunities to Enroll in Law School Courses

Abstract

One of the strengths of the mechanical engineering curriculum is its broad applicability to a variety of professions. Thus, a student majoring in mechanical engineering may end up going to medical school, or earn an MBA. Another such alternative path which is gaining more traction is attending law school or directly applying for a job as a patent examiner where a JD is not required. We strive to provide our students with information to make better career decisions while still working on their undergraduate degrees. We have thus collaborated with our university's law school to allow roughly five engineering juniors each year to enroll in one of their courses taken by second and third year law school students. To date, students have taken a course entitled 'Introduction to Intellectual Property.' This year, a second course is being added: 'Environmental Law.' There are several challenges to overcome to provide this opportunity. For example, our law school is on a semester system while our engineering program is on the quarter system. Until a couple years ago, the two programs maintained different spring breaks. Even tuition and registration becomes problematic due to being in different schools/colleges and one being an undergraduate program and the other a graduate program. However, the benefits to the students have been shown to clearly outweigh the costs. Here we will detail the mechanisms used to successfully implement this program and provide direct feedback from the students who have participated to date. In short, the students unanimously agreed that the program was extremely worthwhile and over 25% of those participating are now considering a career combining engineering and law.

Introduction

ABET accreditation[1] generally ensures that most mechanical engineering programs are similar and include a significant amount of math, science, and particularly engineering topics. Because mechanical engineering is considered a very broad area, more and more students are pursuing complementary careers such as medicine and business. Some universities, such as ours, have a law school on campus. For those universities, there is a great opportunity to expose mechanical engineering students to a possible career in law. Such careers of course include earning a JD and practicing as a patent attorney or possibly working for the Unites States Patent and Trade Office where a JD is not required but some knowledge of patent law along with a science or engineering degree is highly recommended.

Even if mechanical engineering students choose to remain in a technical field, evidence shows that all students benefit from 'softer skills'.[2-3] It is not enough to be technically strong. Individuals must be able to convey their ideas both orally and in writing. Arguments for a technical approach are stronger when there is an understanding of societal and economic issues.

Craft and Baker[4] conducted a study in a 2015 paper on those who go on to earn a JD degree. They looked at the following degree fields preceding the JD: Science and Engineering, Social Science, Political Science, Education, Arts, and Letters, History, Business, Accounting, Economics, Prelaw, Other, and None Specified. From their data, 7.1% of all JDs were students with Science and Engineering degrees. For comparison, Political Science was the highest percentage at 22.2% with Social Science, Education, Arts, and Letters, History, and Business the next highest (ranging from 10-13%). They also looked at average salary. Interestingly, Science and Engineering majors' salary was essentially the average of all JDs – one might have thought that they would be higher. The highest (15% higher than the average) was for Economics majors and the lowest (7% below average) was for Social Science majors.

Law school themselves recognize the value of having multiple disciplines, including engineering, enter their programs and struggle with how to best take advantage. In Gibson's review of "A Critique of Best Practices in Legal Education[5]," he remarked that "many other types of students come to us with values and perspectives to which we – and Best Practices – give little attention. Students trained in math, engineering, and the hard sciences come to us thinking in terms of numbers and universal formulas that produce hard, definite answers. We expect them to think in words, to tolerate conflicting rules, and to work with answers in shades of grey. Students with weak educational backgrounds believe that learning is merely remembering and regurgitating information. We bewilder them when we expect them to use their knowledge to resolve a situation they've never encounter before."

Knowing that some engineering students can benefit for pursuing a legal career, at the University of Denver (DU), our Daniel Felix Ritchie School of Engineering and Computer Science has collaborated with our Sturm Law School enabling primarily junior engineering students to take classes from the law school. Note that we have only mechanical, electrical, and computer engineering majors. Certainly, we are not the first school to collaborate in this way. For example, the University of Missouri at Kansas City has offered a class with law, MBA, and engineering students for more than 10 years[6]. To date at the University of Denver, 11 students have taken Introduction to Intellectual Property with second and third year law students. Although Environmental Law was made available to our students for first time this year, no one opted to enroll – it just was not of equal interest to our computer, electrical, and mechanical engineering students. As detailed next, there were several obstacles to overcome to make this happen. However, as indicated by the direct comments from these 10 students (the 11th is currently taking the course), it is clear that our efforts were worthwhile.

Program Origin

The University of Denver has a history of collaboration among divisions. Four years ago, the University of Denver had a well-established collaboration with Daniels College of Business enabling engineering students to stay for a fifth year and earn both a BS in engineering and an MBA. The program was very popular with roughly one third of engineering students

participating. Shortly after that, curriculum changes allowed students to pursue their BS in engineering while preparing for medical school. During those changes, the idea of collaborating with the Sturm Law School arose. The law school was very receptive – in fact one of the persons representing the law school (co-author on this paper) had a BS in Electrical Engineering in addition to his JD. A plan quickly developed in which engineering students would be allowed to take a course from the law school and there was a clear consensus that the first class to be offered would be Introduction to Intellectual Property (IP) since engineering students are strongly encouraged to create IP and often attracted to engineering as a result.

It was decided that junior engineering students would be the best group to target. Juniors have well settled into engineering and have increased academic and personnel maturity. From an engineering perspective, seniors might have made more sense, but from a law perspective, juniors have the advantage since they still have time to apply for law school should the experience prove particularly fruitful. Of the eleven engineering students to date to take a law school course, 8 were juniors, 2 were seniors, and 1 was a graduate student.

Program Hurdles

The next issue involved registration and tuition. While it would be most direct for the engineering students to register directly into the law course, there were several complications. First, the students were not admitted to the law school. Second, the students would need this credit applied towards their engineering degree. And third, separate registration would increase the student's cost. At the University of Denver, undergraduates pay no additional tuition after registering for 12 credits up to 18 credits. So were a student to take 12 credits through engineering and 4 credits through the law school, they would end up paying for all 16 credits, not to mention the higher law school graduate tuition compared to undergraduate engineering tuition. Thus, it was agreed that the students would enroll in an engineering special topics course, requiring enrollment permission from the engineering contact. Once enrolled, they attend the law school course the same as if they were directly enrolled. It should be noted that although our solution is easy enough to implement, much credit is owed to the law school which is currently earning no revenue through this collaboration but are experiencing an increased workload.

Because our law school operates on a semester system and our engineering program operates on a quarter system, we decided that only spring semester law classes would work. Were an engineering student to take a fall semester law course, they would have to arrive to DU earlier than needed for the quarter classes, and stay after the quarter ended. However, by taking spring semester courses, the student shows up as expected for their winter engineering quarter, starts the spring semester law class a few weeks after, and continues with the course during the engineering spring quarter. Fortunately, as of 3 years ago when we started this program, both schools have the same spring break. Because the students enroll in an engineering course, we have them register during the winter quarter and enter the grade, late, near the end of the spring quarter when the law school reports their grades.

Because the engineering students were taking a class with second and third year law students, the law school took several steps to help the engineering students get used to the different language and teaching styles that law professors use. At the beginning of the semester, the engineering students were given a glossary of procedural terms. Often these terms are critical to understanding the appellate decisions that the students had to read. Of course law students learn this information during their first year. As the class proceeded, the professor would take additional in class time to make sure the engineering students understood these terms and why they mattered.

Because engineering students are typically not used to writing essays, the students were asked to practice writing with law students from the class. Specifically, the first evaluation in each intellectual property class was a take home team essay. Each engineering student was assigned to a team with two other law students. Presumably, this experience would help the engineering students prepare for the final exam which was entirely essay based.

Evaluation Methods

Finally, we had to consider how to evaluate the engineering students. For the Introduction to Intellectual Property course in particular, the grading breakdown was as follows: 75% for a final essay based exam; 10% for a 24 hour essay problem done in teams; and 15% for a multiple choice quiz. The instructor reserves the right to increase or decrease the final grade by half a letter grade for outstanding in-class participation or failure to read the material. In general, the law school grades on a completely blind system. The professors do not know whose work they are grading until after grades are submitted. Thus each engineering student is told exactly how they compare to second and third year law students. However, to encourage participation without punishing students for their lack of legal terminology and writing ability relative to the law students, the engineering and law student scores were separated. While still using a blind system, the engineering students were graded on a slightly higher curve than the law students. The lowest graded earned by an engineering student so far was a B- (C- on the law school curve). The highest grade so far was an A (a B+ on the law school curve). Table 1 shows the distribution of all grades for the 10 students who have completed the course to date (the 11th student is currently taking the course). Note that 'Law' refers to the grade earned relative to other law students; 'Eng' refers to the grade given using the engineering curve. The range of grades earned by the law students is typically A to C-. The law school also requires that classes with more than 10 students have a B median. The intellectual property class taken by the engineering students always falls into this category.

	A	A-	B+	B	B-	C+	C	C-
Law	0	0	1	1	2	2	2	2
Eng	3	2	3	2	0	0	0	0

Table 1: Grades earned to date on both the Law and Engineering curve.

As mentioned, eleven engineering students have taken a course from the law school during the past three years: five in the spring of 2013, five more in the spring of 2014, and 1 currently in the spring of 2015. Although we introduced a course in Environmental Law this year, all eleven students have taken Introduction to Intellectual Property. We believe that course is simply of most interest to our computer, electrical, and mechanical engineering students. During these three years, we have collected feedback from the law school professors and engineering students.

The law professors believe that the class was a success. Although it was clear that many engineering students were initially uncomfortable with the Socratic Method that is part of law school. Most students adjusted well to being "cold called" and seemed to eventually enjoy the dialog. The engineering students would also offer technical insights about the readings that was often beyond a typical law student's experience. What is more, the engineering students appeared to be honestly interested in the topics. That is probably because intellectual property law was an interesting change of pace from the typical engineering class while still being very applicable to their studies. Indeed, one recent graduate has already consulted with one of the professors to discuss a patent issue he is encountering as a practicing engineer.

Feedback

At the end of each class, and before the engineering students' grade was entered, they were asked the following:

- What did you think of the course as an engineering student?
- Are you now considering law school?
- What you would tell an engineering student considering taking this same course next year?
- What would you tell the person teaching the course next time, if anything, to improve the experience for engineering students?
- Do you have anything else to add?

Every student commented that the course was great and that they were glad they chose to take it. Of course, as an optional course, perhaps this is not too surprising. In any case, a list of all comments is provided in the appendix. Here we will highlight some. Specific comments varied from "overall a great and challenging class," to "I would take this course again just because I found the content interesting and useful," to "I would highly recommend that engineering students take this class," to "as an engineer, the course was very relevant. I achieved a basic understanding of trade secrets, patents, copyrights, and trademarks. In a nation/world that is driven by money (and lawyers determined to get your money) it is imperative for engineers to have at least a basic understanding of IP law. That way, their ideas, secrets, and inventions can be lawfully protected."

Another student remarked that "I quite enjoyed the law school class. It was an amazing opportunity to see what other fields an engineering student can enter and still use his undergraduate degree. Overall, I felt I could hold my own against the other 3rd and 2nd year law students except on minor issues such as being familiar with criminal law, Tort Law, and the such. However, I found the engineers excelled in Patent and Trade Secret Law for a few court cases reviewed involved knowing issues such as temporary memory, computer coding, and engineering machine shop practices."

Three of the eleven students said that they are now considering law school. One said they planned to study for the LSAT this past summer. Helping students find their path is very rewarding. Time will tell as to the true impact this class had, but initial signs are very positive.

On the questions about improvement and information to pass along to future engineering students, the responses were quite informative. The majority of students commented that the teaching of these law school courses was great. One student even said that "the engineering school can learn a great deal on how to teach its students from this course and this instructor." There was also a clear consensus that there was a significant amount of reading. "Expect to read anywhere from 20-40 pages of law reading. This 'law' reading is quite different than your normal textbook reading and takes 2-3 hours to complete." Another student remarked that engineering students "have to learn terminology that other law students already know" and that the "grade is almost completely based on the essay final" and that "a quick overview of the format and style of writing desired for law school would be helpful."

Conclusions

After three years and eleven engineering students, our conclusion is that this collaboration between the Ritchie School of Engineering and Computer Science and the Sturm School of Law has been very successful. Every student has said that they are glad they had this opportunity. The law professors have commented that they enjoy having the engineering perspective in their class and do a great job of ensuring that the engineering students are always in groups with just law students. Three of the eleven students are strongly considering law school. In another few years, we will know for sure whether they did in fact pursue that option. In the meantime, we plan to continue this collaboration and are monitoring the demand. Should more than five students a year want to participate, it may require additional actions including revisiting the financial agreement.

References

1. http://www.abet.org/

2. Pulko, Susan H, and Parikh, Samir, “Teaching 'soft' skills to engineers,” International Journal of Electrical Engineering Education 40.4 (Oct 2003): 243-254.
3. Kumar, Sanjeev, and Hsiao, J Kent, “Engineers Learn 'Soft Skills the Hard Way': Planting a Seed of Leadership in Engineering Classes,” Leadership and Management in Engineering 7.1 (2007): 18-23.
4. R. Kim Craft & Joe G. Baker, “Do Economists Make Better Lawyers? Undergraduate Degree Field and Lawyer Earnings,” The Journal of Economic Education, 34:3 (2003), 263-281, DOI: 10.1080/00220480309595220.
5. Gibson, M.T., “A Critique of Best Practices in Legal Education: Five things all Law Professors should Know,” 42 U. Balt. L. Rev. 1, 2012.
6. Luppino, A.J., Kuney, G.W., and Wilcox, J, “Pedagogic Techniques: Multi-Disciplinary Courses, Annotated Document Review, Collaborative Work & Large Groups,” Tenn. J. Bus. L. 73, 2009.

Appendix: Full list of student feedback

Student 1
I thought the class was intellectually stimulating and very informative. The subject matter was often within the realm of engineering. In the cases where it was not, the professor did a great job at making it relevant to the engineering students. Overall, a great and challenging class.

I enjoyed the course. I am not considering Law School, I decided it wasn't for me. However, I think the information as well as the way of thinking that I learned in Intro to IP is very valuable. It will be helpful to understand where lawyers are coming from and what they have been through. I'm glad I took the course and I would recommend other engineering students to enroll in the class. Professor X did a good job explaining law definitions and I liked being in a homework group with law students. They helped me understand what was expected on the final. However, a quick overview of the format and style of writing desired in writing for law school would be helpful.

Student 2
Pros: Interesting material; easily see applications; very impressive professors; a challenge; very little coursework
Cons: A ton of reading; semester seems really long compared to quarters and overlaps 7 weeks in to spring quarter; a lot more material, have to learn terminology that other law students already know; grade almost completely based on essay final

Overall I would take this course again just because I found the content interesting and useful. I am considering law school over engineering grad school. If someone knows they don't want to go to law school then I wouldn't recommend it mainly because of the extra time commitment and very different grading/learning style than engineers are used to.

Student 3
I quite enjoyed the law school class. It was an amazing opportunity to see what other fields an engineer can enter and still use his undergraduate degree. Overall, I felt I could hold my own against the other 3rd and 2nd year law students except on minor issues such as being familiar with criminal law, Tort Law, and the such. However, I found the engineers excelled in Patent and

Trade Secret Law for a few court cases reviewed involved knowing issues such a temporary memory, computer coding, and engineering machine shop practices. On the front of the person teaching the class, I thought very highly of Mr. X. Being an electrical engineer himself, it was easy to relate with his background knowledge for cases. Furthermore, his background stories of being a Patent Attorney in the Silicon Valley were amazing and quite mind blowing.

For students taking the class next year, just remind them that the class is quite harder than the Bus. Law class at DCB. Expect for each class to read anywhere from 20-40 pages of law reading. This "law" reading is quite different then your normal textbook reading and takes 2-3 hours to complete.

On the subject of considering Law school, I am deeply considering. For now I have accepted a full time job offer but will begin studying for the Lsat this summer and hopefully take it in the fall to begin applying for schools. Having this course allowed me to see that Law school is not as hard as I once thought and the subjects covered are actually quite interesting.

Student 4
I found this class to be a bit predictable. Every class seemed to be structured the exact same way. I did find that the class used a different part of the brain, therefore I found the class to be interesting and somewhat challenging. A suggestion I would give to the instructor is to give engineering students an example of how essays are written and how they are structured in the Law School.

I would tell engineering students that there is a lot of reading. If you read all the assignments when they are due it will be very helpful during class and in the final. It does not have a huge course load compared to all other classes that engineering students are taking. I would highly recommend that engineering students take this class.

Student 5
As an engineering student, the IP course was a very new type of class. I felt that it was a good change of pace, and in some respects I even had an edge on most of the law students because of my knowledge of the technical elements present in specific sections of the course. I am, at the moment, not considering law school, but the IP course has provided a great insight to what that path would entail and the benefits of taking it. It simply isn't what I'm interested in at this point in time.

For future students my greatest piece of advice would be to keep up on the readings and do them ahead of time. The density of much of the material makes it very difficult to catch up once you get even the slightest bit behind (which unfortunately I was for a point in time). The professor is very helpful and talking to them is the easiest way to clarify some of the more detailed and complex topics. I would strongly recommend they see the professor any time they are confused about anything. I felt that the teaching approach used to bring the engineering students into the course was well chosen. By having the engineering students always paired with other law students, it created discussions where the engineering students got to learn from the more experienced law students while also bringing their technical skills and knowledge to the table when appropriate.

I felt that Ms. X did a fantastic job teaching the course. She was very helpful and understanding with the engineering students while still pushing us all to really be engaged in class. I really appreciated her availability outside of class and willingness to help whenever possible. I'm very happy that I took her course and I have used the knowledge I gained from her already.

Student 6
My assessment of the Law class is that the class was great. I learned a lot about the subject matter in a very productive way. It was good to change gears and read 1000 pages and have bi weekly discussions regarding the read materials. I found it very insightful working with the law students in class and on projects because it gave me a view and word choice I hadn't used before. I am considering law school as one of my options after undergraduate and a couple years of experience. Next time I would ask the teacher to provide more detailed drawing that patents include. Also would ask to be taught the entire patent writing process and ask to have us write up practice patents on some widget. Overall the course was a new learning experience and I am very glad I took the course.

As an engineer, the course was very relevant. I achieved a basic understanding of trade secrets, patents, copyrights, and trademarks. In a nation/world that is driven by money (and lawyers determined to get your money) it is imperative for engineers to have at least a basic understanding of IP law. That way, their ideas, secrets, and inventions can be lawfully protected.

Student 7
The course offered by the DU law school was relevant, professional, and very educational. To the engineers, it offers a glimpse of the education that a law student receives (ie. large group projects, case evaluations, 10-hour final examinations, etc.). The professor was one of the best, if not THE best, professor I have had a the University of Denver. Substantially more professional and knowledgeable about her subject than many of the engineering professors. Every question asked was answered with a concise and appropriate answer. The curriculum was well established with the organization flowing from trade secrets to patent law to copyright law and finally to trademark law. The professor established links between each intellectual topic to give the students a robust understanding of the interconnectivity of IP law. Constructive feedback was given after every examination (3 in total), and despite living substantially far away, the professor was readily available for office hours.

Student 8
Many times I thought to myself, as an engineering student, that if all law school classes were similar to this one, then I would definitely consider moving on to law school. The engineering school can learn a great deal on how to teach its students from this course and this instructor. In fact, I would recommend that a few engineering *professors* sit in on a few of the classes to learn how to teach.

Overall, it was an effective course and a very effective instructor. It's unfortunate she doesn't know a little about engineering, she could teach a few engineering courses as well!

Student 9
I thought this class was awesome. I enjoyed every day that I went in and learned about a subject that was completely different than all of my other classes. The professor was very inviting of the engineers and the students were also helpful. I don't think I am considering law school unless there is a course path that includes no writing and all debate. I thought the class was uniquely structured and provided me with a new outlook on classroom discussion. Professor banks was very well organized and even more knowledgable. I was impressed with how well prepared she was for our lectures every single class. She knew our text book cover to cover!

For the engineers looking to explore this class next year, I say go for it!! I found the experience invaluable and the change of material allowed me to take a break from the rigorous engineering program. I hope this program is offered in the future to allow other students to have the positive experience that I had this year.

The only downside was the method of examination. We had three exams and each was different. I found it hard to acclimate to the changing exam style and suffered because I was unable to develop a solid method to study such a large amount of material.

Overall it was a great course and I would take it again in a heartbeat. Thanks for the opportunity.

Student 10
I enjoyed the class and feel as though it provided a good taste of what law school might be like. It also served as a perfect introduction to intellectual property law. However, I wasn't considering law school before the class and can't say that I'm considering it now.

I took the course in an effort to better understand intellectual property in case I find myself in an entrepreneurship position down the line. Today, I feel confident in my understanding of "why" we have intellectual property, "what" can be protected, as well as the "law" that might play out in a courtroom. However, I would have preferred a class geared more towards applied IP with a greater focus on "how" to obtain protection, rather than how to defend it in a court room (though we did cover it all lightly). That is, the class provided me with more of the "law" understanding than I think I need at this time, and not quite enough of the steps towards obtaining protection.

I wouldn't expect the professor to change the course in any way because it's offered in the law school for law students and likely serves their needs perfectly. However, to better meet the needs of engineers, she may be able to focus more on the process of obtaining different kinds of protection. I think Mrs. Banks did an excellent job lecturing, guiding class discussions, and keeping students engaged.

In no way do I regret taking the class and I would certainly encourage other students to do so if they intend to pursue any entrepreneurship positions. I would, however, explain to them that it covers the law in great depth and focuses slightly less on steps towards obtaining protection.

On a different note, can we see any kind of analysis of grades? Like how we did on average compared to the law students average?