Program Name: Drafting Technology
Program Contact: Lilya Vorobey
Academic Year: 2023-24
Status:
Updated on:

1. Description of Program

The Drafting Technology Program is a technical program that supports the mission and priorities of the College of San Mateo by providing class offerings that are academically comprehensive and industry compliant with the skills sets and knowledge needed to be employed in professions using the software languages of AutoCad, Revit and Solidworks.

Drafting, is graphic communication that is common to all manufacturing, design, and construction activities. Various businesses and industry use drafting to translate ideas and concepts into working plans thus interpreting an engineer's, civil engineer's architect's, interior designers, and industrial designer's ideas. The availability of computer-aided drafting (CAD) systems has enabled even small drafting firms and individuals to utilize computers for drafting and design. Thus, the purpose of the Drafting Technology program is to help the CSM student community, of all backgrounds, to succeed in their courses with the intent of providing the basics of design software languages used throughout the world.

The Drafting Program at CSM is student focused with project-based leaning that educates a diverse student population. It also supports the Architecture, Engineering, Interior Design (Canada) students as well as an older student population that enrolls to either change career paths or to 'up-skill' in their current job. This need for employment skills currently in demand by employers has led the faculty to develop courses that support the industries, large and small, in the Bay Area. The program works closely with industrial partners assisted by the Advisory Board to improve and provide information needed to make our graduates attractive to hiring industries and small companies in the region. In addition, many students create their own small businesses that offer design consulting.

Currently the drafting program offers an AA, AS degree, a Certificate of Achievement and Certificate of Specialization all of which are based upon recommendations from the Drafting Advisory Committee. Although, each of the software programs taught have numerous certification levels that are administered by AutoDesk for AutoCad and Revit) and Dassault Systèmes for Solidworks. Our program prepares students for the basic certification exams should an employer require any of these exams.

2. Results of Previous Program Review

a, b & c.

The Drafting Program has migrated from one program, AutoCad in a four-semester structure, and a technical hand-drawing course that prepared students to understand the complexities of three-dimensional visualizations, orthographic projections, and GD&T (Geometric Dimensioning and Tolerancing). Because of industry demands, primarily engineering and manufacturing in the area, the Solidworks program was added to the curriculum. Eventually with the slow reduction of AutoCad users in the area (think baby-boomers), Revit, an architectural Building Information (BIM) program, was added to aid architects, construction, plumbing and HVAC designers who can all work on the same drawing at one time.

In a previous PIV that oversaw the Machine Tool, Welding and Drafting Programs, it was decided that the hand-drawing class was to be dropped from the curriculum. The recommendation was to add portions of that course into the AutoCad and Solidworks classes.

The result of dropping the Technical Drawing class has created issues with student's inabilities to realize 3-dimensional and orthographic presentations. In the first five assignments in AutoCad and Solidworks classes, 15% of students (SLO Outcomes) struggle to understand industry standards of drawing presentation (blueprints). This is a department of one full time faculty member who then works with these students in one-to-one Zoom meetings so that they can navigate the drawings successfully. Frankly, spending time with students to help them navigate the 3D world is time consuming although it also brings to light other issues students have such as language barriers, their jobs and family obligations. By spending time with individual students, specific individual recommendations are made to help them assimilate the material. Often additional handouts and assignments are introduced. More than not, these students catch up to the class assignments with perhaps one or two deciding that they should drop and take the course the following semester.

All our drafting software programs are exceptionally large programs. Revit boasts a 15.8 GB download, AutoCad is 10Gb, and Solidworks is 8 GB. For comparison, the entire Microsoft Office is only 2GB. To become proficient in Revit, one year of study is recommended. In contrast, it only takes eight hours to complete a course in Microsoft Word. It is because of the size of the programs; students often do not have a computer that can handle the software. Even Pre-Covid, when we offered face-to-face classes, the amount of extra time students needs to complete homework infringes on their capabilities to afford robust computers.

Last year, COI updates were submitted, and the primary objective was to stress in the catalog that these courses are PC based, not Mac programs. Many students are unaware

that most CAD programs are PC based. COI ignored the updates since the most recent PIV of the program was being conducted. In the PIV form, COI stated that the course updates were not submitted, which is blatantly false.

The fact that the 'PC based course" information was not included in this year's catalog, another dilemma is created at the beginning of each semester where students are either scrounging for a PC or attempting to use Boot Camp or Parallels to run the programs on their Macs. One year ago, ITS provided laptops that could support the software. Those laptops are no longer available. We have other computer labs on campus but none of them can support the software programs.

3. Current Program Review

Findings	Analysis	Resources	Plans to Address Opportunity Gaps
1. *English as a second language students:* Asian 16% Hispanic 22% White 34%	Technical information is difficult to assimilate. Considerable reading comprehension skills are necessary.	Recommendations for a technical reading comprehension course.	Work one-on-one with students. Prepare more handouts for students having difficulty with reading handouts. Please note, there are no textbook requirements. These courses provide free handouts that have been compiled from a myriad of references. The reason for this is that the software used is updated every year. Changes in the software require constant updating of the course handouts to save students the exorbitant price of a textbook that would be worthless within a year.
2. All DRAF Courses are now asynchronous.	Enrollment has improved since students are not required to be in class at a specific time.	CAD Lab at the campuses that would support the programs.	Work one-on-one with students.
3. Students do not have computers capable of supporting the software.	Catalog does not provide information about PC requirements.	VMWare Horizons – an interface for students to log into a server so that they can access the software. Unfortunately, this requires a CAD lab on campus that can support the software.	I have worked with ITS to provide VMWare Horizons – an interface for students to log into the server so that they can access the software that they cannot install on their computers.

(c) Challenges and Opportunities:

The onset of Covid and the opportunity to place all the courses asynchronously into Canvas has open the opportunity for more students to enroll.

Major challenges

1. Program Marketing - difficult with one faculty in the department. The software programs are constantly being upgraded and to provide the latest information in the handouts most of my time is spent researching the new commands and re-writing the handouts. Example: each year, Solidworks provides a "What's New" PDF that is roughly 300 pages. This information is incorporated into the course every year.
2. Computers:

Educating prospective students about the need for a PC computer that can support CAD programs should be in the Catalog as well as on the registration site. During the first weeks of the course, many students fall behind since they do not have access to a computer that will support the software.

There are laptops available at Costco for $450 to $600 that could be provided through ITS or the library. Unfortunately, ITS buys the least expensive laptops for loaning to students.

4. Planning

a) Discipline-level and SLO (Student Learning Outcomes) assessment

Student Learning Outcome assessments and retention is a continual focus throughout the drafting course offerings. Quizzes are given throughout the semester to evaluate student retention of the use of the software in industry applications. The result in these quiz assessments has shown a better than 77 -79% success rate across the three beginning classes (Revit (77%, AutoCad (77%) , Solidworks I (78%) with an 88% success rate in Solidworks II.

Since the program is being discontinued in the next year or (?), the same type of comprehension quizzes will be the assessment used this semester and next. All quizzes evaluate basic understanding of the program nomenclature as well as being able to create a drawing from a teacher driven example that uses ANSI Drafting Standards. Certification exams that are like the AutoDesk User Study Guides for AutoCad and Revit as well as the SolidWorks Certification Exam Guide provide the foundation of all the quizzes given in the department.

b) Program goals

Student success metrics across race/ethnicity, socioeconomic status, gender, physical or mental abilities, and other demographic traits and intersectionality all can only be addressed on an individual basis with CAD students.

Equity gaps or disparities in CAD courses appear when:

1. students do not have access to a computer that can support the software.

2. English as a second language presents problems in assimilating the course handouts.
3. Understanding the complexities of three dimensional and orthographic representations.

All three issues are addressed at the beginning of each semester in each course. Since I am the only faculty in the department, my time is comprised of working with students on an individual basis, searching for new methods of disseminating three dimensional and orthographic representations via handout and videos and working building trust with students who do not speak English at home. Having experienced the problems and concerns with ESL in my own life, I am very adamant about connecting with most students who have difficulty reading, writing and comprehending this new software language.

The foremost goal of the department has always been to prepare the students for certification level exams. Rather than feeding students with specific questions that appear on the certification exams or having them do step-by-step tutorials, critical thinking has always been the foundation of their working out a drafting problem that has real-world applications.

To achieve these goals and plans I work and collaborate with industry individuals.

Resources need for the next school year:
Product: SOLIDWORKS Educational Network **1yr** Support Renewal: $2500.00
Or SOLIDWORKS Educational Network **3yr** Support Renewal $5860.00
Please note that the Engineering program has used our software for free.

5. CE Only

a) Labor Market Data
In the following table, there is a projection of 7.1 to 28.4 Occupation Projected growth over the next 10 years in CAD related jobs. Since the Drafting department supports other majors, and is not a stand alone major, the table shows only the primary occupations that require CAD skills.

In the Bay Area, there are hundreds of job shops that have 5-10 employees. Labor market data never takes these employers into consideration since they rarely post jobs in local papers. Word of mouth and referrals are done within the manufacturing, design, and construction/architecture communities as well through our contacts in the Advisory Committee.

My own small business that provides tech companies in the area with manufactured goods, also refers numerous students to various small companies throughout the Bay Area.

Top Occupations

Occupation	Total Job Postings (Last 12 Months)	Job Postings Requesting Certification(s)(#)	Job Postings Requesting Certification(s)(%)	Occupation Projected Growth (10 Years)	Associated Education Level
CAD Designer / Drafter	724	10	1.4%	8.3%	Associate's degree
Graphic Designer / Desktop Publisher	2,461	9	0.4%	7.1%	Associate's degree
Mechanical / Electrical Drafter	397	8	2.0%	7.5%	Associate's degree
Civil / Architectural Designer / Drafter	163	8	4.9%	9.9%	Associate's degree
Surveying / Mapping Technician	118	6	5.1%	10.3%	High school or vocational training
Architect	1,706	5	0.3%	5.6%	Bachelor's degree
Mechanical Design Engineer	1,663	4	0.2%	10.3%	Bachelor's degree
Incident Analyst / Responder	374	4	1.1%	28.4%	Bachelor's degree
HVAC Engineer	277	4	1.4%	10.3%	Bachelor's degree
Electrical Designer	622	3	0.5%	11.5%	High school or vocational training

b) Degrees and Certificates

Student in the Drafting Program are aware that specific software certification exams are the standard for industry jobs. Thus, the Degrees and Certifications provided at CSM are secondary to the individual software certifications. Occasionally, students obtain an AA or AS degree in programs that use the drafting courses as the foundational language such as AutoCad and Revit in Architecture or Solidworks in Engineering.

c & d)

Advisory Board Members:

Bob Sherens

Dean of Architecture Kent State, Emeritus

Michael Toschi

Michael Toschi International ~Hand-made Italian Shoes & Clothes

Will Whitted

Industrial Designer / Engineer, Google, Retired

Joe Nobles

Industrial Designer, Design Director, Tournesol Siteworks

Nickolas Smith

CADD Layout Design Drafter A, Northrup-Grumman, Santa Clara, CA

Diana Bennett

Professor, CSM DGME

Last meeting notes ~ 15 May 2022

- More real-world projects once the students have comprehended the software. Consider adding projects that require budgeting for materials – which will require more guidance about materials. Find a playground or a zoo where they would accept the idea of free designs for the experience.
- **Pros of face-to-face**
  Students can ask timely questions.
- **Cons of face-to-face**
  - Gas prices higher
  - Public transportation to CSM difficult especially in the evening.
    Students do not learn how to work independently -rely too much on teacher to guide them instead of learning how to trouble shoot.
- Sketching and drawing: Very Important!
- Collaboration and in-person team skills are still important.
- To be able to work independent and especially in a creative space is more important than ever at this moment in our culture. We've been isolated from companionship in workspace but we have not lost our creative ability to produce. Everything creative always comes from within so get used to letting it out and sharing it and putting into a productive place with the delivery of being alone. I believe in the creative space, being self-guided is part of a successful career. I find it in the alone time where the genius surfaces.
- I find tactile engagement and necessity and powerful connection to the real world. As we will move into virtual spaces, we end up leaving voids in real spaces that I think are important for the human element, heart, soul. Computers can't do everything and we wouldn't want them to anyway.
- Get your hands dirty.