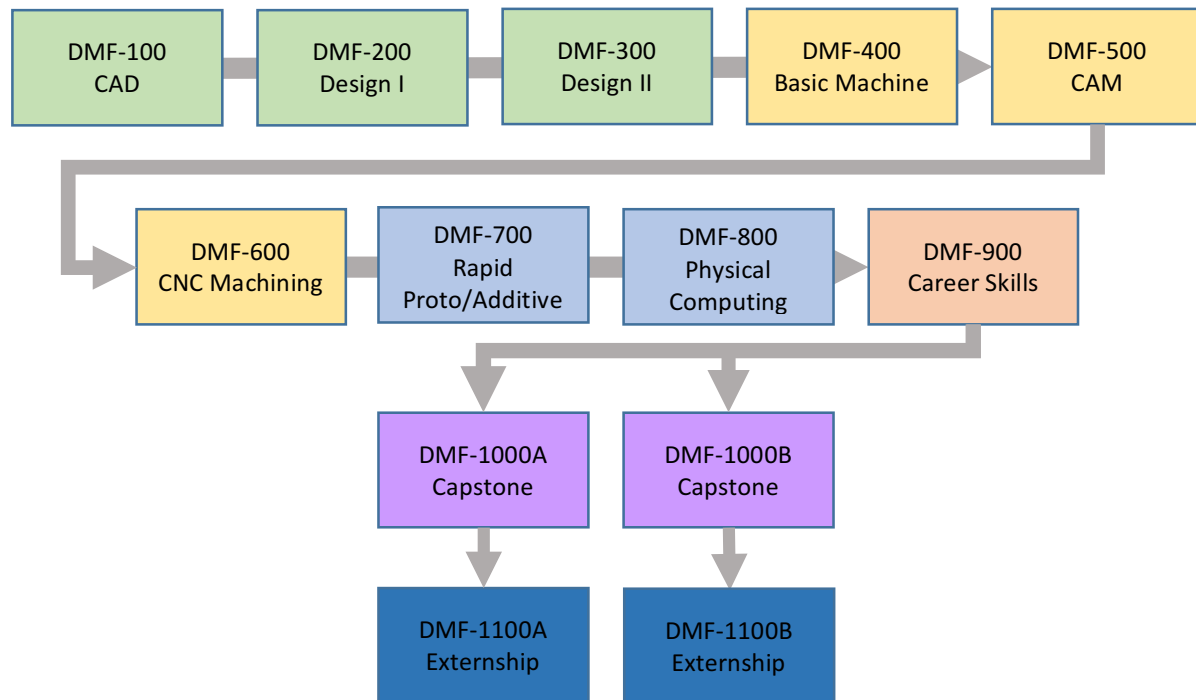


DM&F Course Summary:

- DMF-100 - CAD (Solidworks & Light-lift Software)
- DMF-200 - Design Principles I
- DMF-300- Design Principles II - Laser Scanning and Photogrammetry
- DMF-400 - Basic Machine Shop Principles
- DMF-500 - Computer Aided Manufacturing
- DMF-600 - CNC Machining Systems
- DMF-700 - Rapid Prototyping & Additive Tech
- DMF-800 – Physical Computing
- DMF-900 - Career Readiness Skills
- DMF-1000 - Capstone Project (Track 1 or 2)
- DMF-1100 - Industry Externship (Track 1 or 2)



DMF-100 - CAD (SolidWorks and “Light-Lift” Software)

The objectives of the course are to equip students to be proficient (to industry standard) in SolidWorks. Students will learn the SolidWorks interface, tool-set use and best practices. Students will learn the characteristics of the various file formats in which 3D designs may be saved and will utilize a wide range of straightforward and “light-lift” (easy-to-use) software platforms—such as Meshmixer, Fusion 360 and SketchUp—to support and streamline the use of the CAD SolidWorks tool. Students will learn to create “watertight” (3D mesh with no holes, cracks or missing features) 3D models. Students will design three-dimensional models that may be produced as actual physical artifacts via Computer Numeric Control (CNC) and Rapid Prototyping (3D Printing).

The course will introduce shop safety standards and will summarize appropriate Federal and State standards associated with Rapid Prototyping equipment, materials and process including SDS Notices and “Right to Know” Law, Personal Protective Equipment (PPE), Machine Tool Safety, Hazardous Waste, and Fire Prevention procedures.

The course will cover intellectual property and copyright infringement law to provide students with a framework from which they can design new product, and to prevent them from developing plagiaristic practices.

DMF-200 - Design Principles I

Students will develop a foundation of design principles, theories and techniques to be used in the service of the creation of consumer and light industrial objects. Students will develop processes for integrating ideation and iteration principles to develop and refine workflow process and designs, and will show an understanding of aesthetic principles to create works that fundamentally engage the user. Students will demonstrate an understanding of volume and space and learn how to use design-thinking strategies in workflow. Students will develop their processes for enabling and building upon their inherent creativity and inspiration. Students will demonstrate an ability to use online digital media and web-based and mobile application technology in workflow and the production of artifacts. Students will demonstrate the ability to integrate basic machine-shop principles and practice, Intro CAM and CNC programming, and CNC machining systems with design principles and additive manufacturing.

DMF-300 - Design Principles II, Laser Scanning and Photogrammetry

Students will receive advanced design-theory principles and demonstrate the ability to use design by alteration to create new work from pre-existing objects. Students will explore design research methods involving observation, empathy, ethnography, participatory design, human factors / biomechanics and the psychology of experience to understand client motivation, environmental systems, and data in the service of novel “consumer and light industrial” work and products.

Students will demonstrate the ability to use contemporary ornamentation in their workflow and work to increase functionality (e.g., informational, usability or faux) and/or aesthetics (e.g., emotion, beauty, physiological). Students will demonstrate the ability to integrate and create unique web-based tools for specific workflows. Students will use design functionality analysis to critique and refine work.

Students will learn fundamental laser scanning and photogrammetry technique in the service of the above and demonstrate comprehension of interface and best practices in specific laser scanning and photogrammetry tools. Students will demonstrate the ability to create 3D files using these tools and demonstrate the ability to use laser scanning and photogrammetry tools in reverse engineering and in their own digital object storage.

DMF-400 Basic Machine Shop Principles and Practices

This course will provide an overview of the broad scope of basic machine shop principles and introduce the student to the machine shop environment, manual machining, turning tools and part holding methods. Students will be equipped with the required understanding for safe material handling, safe operation of equipment, and the importance of proper equipment maintenance. Students will develop an ability to interpret blueprints and understand shop level dimensions and tolerances, along with understanding mathematic skills needed for manufacturing parts. Students will learn to use measurement tools, including calipers, micrometers, height gauges, measurement pins and gauge blocks, and to develop skills for the set-up and safe operation of vertical and horizontal saws, manual milling machine and manual lathe. Students will also develop skills to utilize machine DROs (digital read out) to further assist part set-ups.

DMF-500 Computer Aided Manufacturing

Students will develop an understanding of G and M code language and how they apply to different types of machines. They will understand the CNC Machine Coordinate system and the differences between different machine types, and develop knowledge of different CAD file formats and how the CAD files are used in the manufacture process. Students will develop proper machining and turning methods for different materials and learn how access technical data required for this task. They will learn the MasterCAM User Interface and part modeling tools, create a CNC process model, and produce CNC code to safely function in CNC machines.

DMF-600 CNC Machining Systems

Students will develop a working knowledge of controls for CNC Machining Centers, CNC Turning Centers and 2-Axis CNC Profiling Systems. They will develop an understanding of the Work Coordinate System as it relates to different types of machines, and understand the setup of CNC tooling and how to apply set-up techniques to different types of machines. Students will develop skills to safely run an initial part, complete a first part inspection, and understand advance fixture and program techniques for efficient production environments.

DMF-700 – Rapid Prototyping and Additive Technologies

To introduce students to a suite of additive technologies tools. Students will develop knowledge of the tool characteristics, best practices, maintenance, consumables/materials and tool tendencies. Students will be introduced to the various additive manufacturing tool interfaces and develop an understanding of the consumables/materials characteristics and specifications for each tool and how to look up needed information to properly accomplish this. Students will be equipped with the skills to predict which tool is best for the production of a specific object/artifact. Students will demonstrate the skills necessary to operate a suite of additive technologies tools using SolidWorks design 3D objects, to be fabricated on each of the

tools. Tools will include: powder printing, stereolithography, FDM (fused deposition modeling), Polyjet printing and laser sintering

DMF-800 – Physical Computing

Students will receive theoretical, technical and hands-on experience with do-it-yourself “tinkerer” technologies. Students will qualify in light electronics, sensors, data and user-friendly circuit boards such as Arduino and Raspberry Pi. Students will revisit tools and technologies previously covered and view them through the lens of an inventor or specialist.

DMF-900 - Career Readiness Skills

This course is designed prepare students for gainful employment using the aptitude and knowledge acquired throughout *the Digital Modeling and Fabrication* program, and takes place incrementally through the entirety of the program. Group and individual student counseling sessions are conducted to lead each student to personal insight concerning their preferences for externship experience, and more importantly their long-term vocational interests. Students are taught the importance of soft skills and best practices associated with resume writing and interviewing. Students will also be taught how to leverage a variety of platforms when researching externship opportunities and will visit companies that operate in this industry.

AMT-1000A – Optional Industry Track 1: Innovative Designer / Maker

This track teaches student’s entrepreneurial skills and philosophies, equipping them to work in a new company startup environment, or with an established mid-sized company in a design focused business environment; or to start and manage their own business, developing designs and producing physical artifacts. Students will demonstrate the ability to transform an idea into a product. Demonstrate an understanding of design history as it relates to the convergence of product design and manufacturing and demonstrate an understanding of the concepts behind developing a product that “fills a need”. Students will develop a business model, pitch decks and learn to create a network of colleagues to facilitate the evolution of an idea into a viable product.

DMF-1000B – Optional Industry Track 2: CNC & Additive Technology Technician

This track teaches students how to operate and run a wide variety of additive and subtractive technologies and software packages. Students will demonstrate the ability to be a general problem-solver and liaison between manufacturing and other workplace departments in a wide variety of businesses. Specifically, students will be able to assist a company in improving products and reducing costs and demonstrate the ability to create and give public presentations. Students will demonstrate the ability to integrate workplace culture into their own workflow and work practice, and demonstrate the understanding and principles of team building. Students will receive a background in workers’ rights, OSHA requirements and agencies associated to their field.

DMF-1100A & 1100B – Industry Externship

Students undertake a significant experiential learning opportunity with a company engaged in relevant processes and technologies. The externship represents an educational strategy that links classroom learning and student interest with the acquisition of experience in an applied work setting. Through direct experience students gain an understanding of the work site applied technologies, procedures, and operation. Through direct observation, reflection and evaluation, students gain insight into the company's mission, methods and objectives. This experience is related to the student's educational program and provides a perspective on the relationship of their learned skills and their application in a real-world productive setting. The experiential immersion in a company environment assists students in the formation of career and employment related goals.