

Syllabus  
PHOE-150: Tools for Advanced Manufacturing and Photonics  
xxxxx College (Fall 202x)

Instructor: xxxx xxxxx

INSTRUCTOR EMAIL: xxxxx

INSTRUCTOR OFFICE: xxxxxx

OFFICE HOURS: xxxx

Call: xxx xxx xxxx (Online Zoom Meetings by Appointment)

Catalog Description: This 14-week course, which includes lab, online, and in-class lab components, provides a hands-on introduction to the mechanical and advanced manufacturing systems and materials for design engineering and CNC manufacturing. Applications include design with Solidworks, MasterCam, additive and subtractive manufacturing, 3D scanning, 3D printing and metrology applications.

Prerequisite: PHOE140

Credit hours: x

This course provides an overview of the mechanical and manufacturing concepts necessary for the understanding of design tools and fabrication processes along with the safety requirements for working with lasers. Emphasis will be placed on the properties of specific materials in manufacturing processes. Students will develop hands on lab skills. Online course modules that provide video lectures and quizzes will be used to test whether the student is ready for lab work. PHY 150 is a course in the second semester of the Photonics Technician Certificate program.

Student Learning Outcomes: As a result of successful completion of this course the student will be able to

- Understand and explain the role of mechanical components in design and manufacturing with additive and subtractive manufacturing.
- Design from concept with Solidworks and MasterCam and create working machine parts.
- Understand and explain the design process from concept thru implementation.
- Troubleshoot and carry out preventative maintenance on 3D Printers and subtractive milling machines for set-up and safety.
- Address safety issues related to manufacturing machine tools and electrical components.
- Characterize and describe the mechanical, electrical, optical, and thermal properties of materials with laser alignment and 3D scanning.
- Understand and explain pneumatic and hydraulic control systems as related to machine tools.
- Ability to describe process and control principles for advanced manufacturing
- Understand how to design with CAD & CAM software and interpret engineering drawings.

- Understand inspection processes utilizing RF calipers, micrometers and measurement data.
- Following instructions, writing work instructions and reading data.
- Reading Mechanical and Machine Drawings and understanding Datum's, Orthographic Projection and Tolerances (GD & T).
- Laser Safety as it relates to advanced manufacturing
- Follow protocol and discipline for shop and machine safety.
- Safety: Safety is an essential component of this and all courses. Safety will be covered at the beginning of the course and we will continue to follow OSHA-10 standards and laser safety standards. Students violating safe practices will be asked to leave the class for the remainder of the class period. Removal from class more than one time for non-safe working practices will fail the course.

Evaluation: The student will demonstrate learning through online quizzes, in-class tests, and through lab work. Course grades will be determined by

Online Amatrol Learning & Quizzes	30%
Discussion Board Questions	20%
Written Safety Quizzes	20%
Final Lab Team Project	30%
Total	100%

Topics covered:

- Lasers in manufacturing
  - 3D Laser Scanning, Calibration & Additive Manufacturing with Markforged Fiber 3D Printer.
  - Understanding of class 1 to class 4 laser systems and their applications.
- Design Engineering with Solidworks and CNC Cad/Cam w/MasterCam Mill
  - Part Modeling and Engineering Drafting w/GD & T
  - Creation of G-Code for Subtractive Manufacturing utilizing Emco Concept Mill 55
- Basic thermodynamics with machine tooling, additive & subtractive manufacturing
  - Heat, energy, and temperature
  - Latent and specific heats
  - Heat transfer and thermal conductivity
- Materials
  - Physical properties of metal solids and fiber 3D Printing
  - Shear and stress with subtractive and additive manufacturing
  - Thermal expansion of machine tooling, 3D Printing and Scanning
- Mechanical aspects of manufacturing systems

- Mechanical drives and gear systems
- Pneumatics, hydraulics, and pumps
- Laser Alignment
- Machine Shop Safety, Laser Safety & Metrology
  - Safety, Process & Control including manufacturing techniques and set-up.
  - Handling, building and aligning optical components. Working in a manufacturing lab.
  - CNC Machining and utilizing metrology hand tools for accurate measurement

### **Course Attendance:**

Frequent absences make it hard to keep up with course material, especially in such a fast-paced program. Since later courses build on the material in earlier ones, excessive absences in one course can cause difficulty throughout the entire program. In addition, regular attendance develops appropriate workplace habits that will be vital in your future employment. Missing lab work is especially to be avoided since it may affect your lab partners and it may be difficult to arrange time for make-ups of the missed work.

Because of this, the instructor, may limit the amount of missed lab work to be excused, or may place a limit on the number of absences that are allowed. On occasion an absence may be unavoidable due to emergencies, but excessive absences may lead to your failure of the course and possibly removal from the program.

In your professional career, you will need to arrive at work on time every day and to keep your employer informed of unavoidable absences. Similarly, maintaining communication with your instructors is vital to success in this program. If an absence or tardiness is unavoidable, let the instructor know you will not be present, and immediately make arrangements to make up any work that was missed.

### **Failure or withdrawal from a course:**

If for any reason a student fails or withdraws from a course but wishes to continue in the program, the student will need to retake the course the following year, at their own expense. Any other courses for which the missed course is a prerequisite cannot be taken until that course has been successfully completed. Only in extreme and unusual cases would a waiver of the prerequisites be issued.

### **Remediation:**

If Attendance (below 80% of course dates and duration of each course time), Performance (grades trending below a C- range) and Participation (appropriate for course) levels become a concern and without notifications and discussions (communication) with Instructors, the Program Advisor and Program Coordinator will be notified and a meeting will be requested between student, Advisor, Coordinator and Instructor to discuss remediation and program options (that may also include dismissal from the program).

6/29/2020

