

Ophthalmic Fabrication
East High School
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Course description: This course covers the role and responsibilities of a fabricating optician, preparing students for further studies or employment in the optical fields. Students will be introduced to the reasons and principles of vision care, the tools required for vision correction, and learn to use machines for manufacturing prescription eyewear. Students will complete a variety of projects to further their knowledge of the optician and the roles they play in the workforce. Local opticians and optometrists will be invited in to discuss their roles in the marketplace and to help motivate and encourage students. As a culminating assessment, students will manufacture corrective glasses from a doctor's prescription and will be eligible for internships, job references, and will be eligible for a 3 credit course in an Ophthalmic Fabrication Associate's Degree at Erie Community College.

This course will involve lecture, class activities, and laboratory work-time, finishing with a full work-time atmosphere, and will be completed over the course of a single school year. Students will be assessed through both formative assessments, where they show they have learned important conceptual information, and summative assessments, where they will demonstrate the skills they have acquired. Students who do not demonstrate successful acquisition and retention of optician skills will not pass the class and are not eligible for Erie Community College credits.

Textbook / Support Material / Resources

The content for this course is supported and developed through continuous support of the OPTICS council. The textbooks used in this sequence are Essentials of Ophthalmic Dispensing and The Dispensing Optician. Our supportive websites are www.Allaboutvision.com and www.Opticianworks.com.

Course Outcomes: Upon completion of this course students will be able to:

1. Describe the structure and functions of the human eye
2. Explain how diseases and deformities of the eye affect vision
3. Demonstrate and explain proper use of the lensometer
4. Neutralize spherical and spherocylindrical lenses
5. Read and fill out optical work tickets
6. Layout single vision lenses for correct placement of optical center of lens in relation to geometric center of frame
7. Produce patterns for frames
8. Successfully edge lenses for insertion into frames
9. Demonstrate proper techniques of hand beveling ophthalmic lenses
10. Exhibit knowledge of hand tools and their appropriate uses
11. Successfully bench align frames
12. Verify and dispense completed spectacles to meet ANSI Standards

NYS Learning Standards addressed:

Standard 1: Analysis, Inquiry, and Design - Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

Standard 2: Information Systems - Students will access, generate, process, and transfer information using appropriate technologies.

Standard 3: Mathematics - Students will become mathematically confident by applying mathematics in real-world settings

Standard 4: Science - Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

Standard 5: Technology - Students will apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human needs.

Standard 6: Interconnectedness: Common Themes - Students will understand the relationships and common themes that connect mathematics, science, and technology and apply the themes to these and other areas of learning.

Class Sequence:

1. Introduction to the course and optometric professions – 1 week
 - a. Safety regulations
 - b. Class expectations
 - c. Define vision care technology
 - d. The history of eyeglasses
 - e. The people of the trade
 - f. Educational requirements

2. Project # 1: Optician interview – 1 week
 - a. Students will find and interview an optician (10 - 15 minute interview)
 - i. Students will ask questions regarding how the optician got into the job, what they like, what they find difficult, as well as other pertinent questions
 - b. Students will write a short report about the interview and will share it with the class.

3. Introduction to optics – 1.5 weeks
 - a. The visible spectrum of light
 - b. How light travels
 - c. Prisms and light

- d. Lens laser lesson
 - e. Characteristics of concave/convex prisms
4. The Eye – 3 weeks
- a. Structure and function of the eye
 - b. Conditions of the eye
 - c. How lenses correct vision
 - d. Define Astigmatism
 - e. Types and causes of astigmatism
 - f. Treatment for astigmatism
 - g. Astigmatic lenses
 - h. Eyeglass problems for astigmatic patients
 - i. Pupillary distance measurements – using the PD stick and the pupilometer
5. Lenses & Frames – 2 weeks
- a. Characteristics of concave/convex lenses
 - b. Lens materials and uses of the different types of lenses
 - c. The surfacing procedure – creation of curves as it pertains to vision care
 - d. Reading the doctor's prescription
 - e. Mathematical transposition of prescriptions
 - f. Working with polycarbonate lenses
 - g. Basic parts of a frame
 - h. Temple types
 - i. Frame materials
 - j. Frame assembly
6. Field trip #1 – Erie Community College
- a. Visit the Ophthalmic Dispensing section of ECC
 - b. Meet faculty and students
 - c. Observe similarities and differences in high school and college setting
7. Introduction to the lensometer – 3 weeks
- a. Parts of the lensometer
 - b. Correct usage of lensometer
 - c. The lensometer diopter scale
 - d. Neutralizing spherical lenses
 - e. Neutralizing cylindrical lenses
 - f. Understanding Prism
 - g. Creating Prism in lenses - Using a prism ring
 - h. Marking lenses in minus cylinder form
 - i. Neutralizing lenses and finished jobs
 - j. Lens tolerance (ANSI)
 - k. Checking finished jobs

8. Frames – 1.5 weeks
 - a. Types & materials of frames
 - b. pros' and cons' of different frame types
 - c. Frame measurements (A, B, geometric center, bridge, and temple)
 - d. Picking appropriate frames for the patient face shape

9. Single Vision Lens Layout – 1.5 weeks
 - a. The blocker and components of blocking systems
 - b. Lens layout
 - i. Optical vs. geometric centers of frames and lenses
 - c. Decentration and frame PD

10. Edging the finish lens – 3 weeks
 - a. Edger parts and safety
 - b. Types of edgers
 - c. Patterns and pattern making
 - i. Hand making the pattern
 - d. Edger usage and template creation
 - e. Edger maintenance and general upkeep
 - f. Hand beveling techniques
 - g. Safety beveling techniques

11. Field Trip # 2 – Rochester Optical tour & Eye Works production facility
 - a. Compare large scale optical fabrication facility and an alternative type of fabrication facility
 - b. Observe ways to set up an optical shop in an urban setting
 - c. Visit optical store with clients
 - d. Observe Eye exam

12. Project # 2: Develop an Optical Shop – 1.5 weeks
 - a. Students will develop their ideal optical shop. Including machine placement, frames and stock, and doctors' offices.
 - i. Can include surfacing and finishing capabilities or just finishing
 - b. Students will present their shops and their reasoning to the class

13. Mounting, Bench Alignment, and Verification of fabricated spectacles – 3.5 weeks
 - a. Working with various Optical hand tools
 - i. The optical screw driver
 - b. Mounting zyl frames
 - i. Using the hot box and air warmer
 - c. Mounting in metal frames
 - d. Frame alignment
 - e. Checking prescription in mounted lenses to patient Rx
 - i. Applying ANSI standards (PD, power, and axis)

14. Adjustments and Dispensing – 2 weeks

- a. Adjusting frame components for individual faces
 - i. Nose pads, temples, tilt, frame level
- b. Dispensing to patient

15. Final Assessments: 2 weeks

- a. Written assessment testing the knowledge gained over the course of the year
- b. Performance assessment demonstrating acquisition of skills learned over the course of the year
- c. Final projects
- d. Students will be given a patient prescription and a patient (student in class) and will assist the patient in finding suitable frames, take all measurements, and fabricate spectacles for patient.
 - i. Student will make their own pattern for the chosen frames
 - ii. Spectacles must pass with better than ANSI standards to be successful
 - 1. Unsuccessful lenses will be returned and student will be allowed to try again

16. Remainder of course

- a. Students will, upon successfully demonstrating ability to produce quality eye wear, manufacture spectacles for patients in the RCSD, to be verified and dispensed by a NYS licensed Optician
- b. Possible internships