UNIVERSITY COLLEGE of the FRASER VALLEY

COURSE IMPLEMENTATION DATE:	January 1995
COURSE REVISED IMPLEMENTATION DATE:	September 2006
COURSE TO BE REVIEWED:	November 2009
(Four years after UPAC final approval date)	(MONTH YEAR)

OFFICIAL COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use.

Shaded headings are subject to change at the discretion of the department and the material will vary - see course syllabus available from instructor

FACULTY/DEPARTMENT: **Faculty of Science, Health & Human Services / Physics**

COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS
PHYSICS 302		**3**

COURSE DESCRIPTIVE TITLE: **Optics**

CALENDAR DESCRIPTION:

This introductory optics course surveys both geometrical and wave optics. Topics will include laws of reflection and refraction; interference and diffraction, fourier methods and holography.

PREREQUISITES: **PHYS 222 or (PHYS 105, 112 and 221)**

COREQUISITES:

SYNONYMOUS COURSE(S)

(a) Replaces: **n/a** *(Course #)*

(b) Cannot take: **n/a** *(Course #)* for further credit.

SERVICE COURSE TO: *(Department/Program)* *(Department/Program)*

TOTAL HOURS PER TERM: **75**

STRUCTURE OF HOURS:

Lectures:	**75**	Hrs
Seminar:		Hrs
Laboratory:		Hrs
Field Experience:		Hrs
Student Directed Learning:		Hrs
Other (Specify):		Hrs

TRAINING DAY-BASED INSTRUCTION

LENGTH OF COURSE:

HOURS PER DAY:

MAXIMUM ENROLLMENT:	**24**	
EXPECTED FREQUENCY OF COURSE OFFERINGS:	**every 2 or 3 years**	
WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only)	☐ Yes	☐ No
WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department)	☐ Yes	☒ No
TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE:	☐ Yes	☒ No

AUTHORIZATION SIGNATURES:

Course Designer(s): R. Woodside; revised P. Mulhern

Chairperson: Gillian Mimmack *(Curriculum Committee)*

Department Head: Norm Taylor

Dean: Jackie Snodgrass

UPAC Approval in Principle Date:

UPAC Final Approval Date: December 14, 2005

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

This course introduces the student to methods and techniques of optics. The student will learn about the brief history, one dimensional waves, plane waves, wave equation in three dimensions. Polarization: linear, circular, elliptical polarization, dichroism, calcite, scattering, reflection; Faraday, Kerr, Pockel effects. Review of Maxwell's equations, electromagnetic waves, energy and momentum, radiation, interaction of light and matter. Reflection and refraction, Fresnel equations. Geometrical optics: lenses, mirrors, optical instruments, matrix methods. Waves: superposition, standing waves, beats, group velocity, fourier analysis, wave packets. Interference: wavefront-splitting, amplitude-splitting, Fabry-Perot interferometer, multiple beam interferometry. Diffraction: Fraunhofer and Fresnel diffraction, many slit diffraction, circular aperture. Fourier Optics. Coherence theory.

Outcomes:

Students should be capable of:

1. Solving problems in geometric optics.
2. Being conversant with aberrations of lenses.
3. Solving problems in wave optics including single and multiple beam interference, and near and far field diffraction.
4. Have an understanding from various topics in modern optics which could include: Fourier optics, Coherence Theory, laser operation, or fiber optics.
5. Solving various problems in each of the topic areas listed in the Calendar Description section.

Objectives:

This course provides both an overview of elementary optics and in-depth analysis of selected advanced topics.

In geometric optics, thin lens and mirror equations in the paraxial approximation will be covered. Advanced geometric optic topics of thick lenses, matrix methods, and aberrations may be discussed.

In wave optics, Young's double-slit interference and Fraunhofer diffraction will be covered. Additionally, multiple beam interference, dielectric mirrors, Fresnel equations, Fresnel diffraction, Coherence Theory, and polarization may be discussed.

METHODS:

The course will be taught using lectures, demonstrations, and computer simulations. Problems will be assigned and marked on a regular basis.

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

Credit can be awarded for this course through PLAR (Please check:) ☒ Yes ☐ No

METHODS OF OBTAINING PLAR:

Departmental Review and/or Course Challenge

TEXTBOOKS, REFERENCES, MATERIALS:

[Textbook selection varies by instructor. An example of texts for this course might be:]

TEXTS: Optics, 4th ed.; E. Hecht; Addison Wesley (1987)

References: Optics, 2nd ed.; M.V. Klein, T.E. Furtak; Wiley and Sons (1986)

Introduction to Optics; F.L. Pedrotti, L.S. Pedrotti; Prentice Hall (1987)

SUPPLIES / MATERIALS:

STUDENT EVALUATION:

[An example of student evaluation for this course might be:]

Assignments	20%
Midterm Examination	30%

Final Examination	50%
	100%

COURSE CONTENT:

[Course content varies by instructor. An example of course content might be:]

Week	Topics
1	Brief history, one dimensional waves, plane waves, wave equation in three dimensions
2	Polarization: linear, circular, elliptical polarization, dichroism, calcite, scattering, reflection; Faraday, Kerr, Pockel effects.
3-4	Review of Maxwell's equations, electromagnetic waves, energy and momentum, radiation, interaction of light and matter.
4-5	Reflection and refraction, Fresnel equations
6-7	Geometrical optics: lenses, mirrors, optical instruments, matrix methods
8-9	Waves: superposition, standing waves, beats, group velocity, wave packets.
10	Interference: wavefront-splitting, amplitude-splitting, Fabry-Perot interferometer, multiple beam interferometry
11	Diffraction: Fraunhofer and Fresnel diffraction, many slit diffraction, circular aperture.
12	Fourier Optics.
13	Coherence theory.