

COMPREHENSIVE LABORATORY BASED EDUCATION PACKAGE INVESTIGATING PHYSICAL OPTICS & WAVE PROPERTIES OF LIGHT



MAIN FEATURES AND BENEFITS*

- Addresses polarisation, reflection and refraction, diffraction, interference and coherence
- Modular design enables users to purchase only particular parts of the complete package of immediate interest and leaves open the possibility of future upgrading by the addition of further modules
- Upgradable to address applications of optics, such as optical waveguiding.
- All necessary optical, optoelectronic and opto-mechanical hardware
- Extensive literature support including: student and instructor's manuals with exercises, solutions & sample results for the instructor
- Detailed lecture notes, tutorial examples and solutions to assist with the development of courses
- Saves significant course, literature and hardware development effort

*Full details of the experiments and equipment specifications are provided overleaf

Laboratory Exercises

The OPTOSCI 'Principles of Physical Optics' educator kit consists of four separate modules (polarisation, reflection and refraction, diffraction, interference and coherence) which enable students to examine physical optics and the wave properties of light to provide a solid grounding in the fundamental optical principles that are applied in various optical systems and instruments. The four modules (POL, R&R, DIFF, I&C) can be supplied individually, or combined as a modular / complete package. A summary of the laboratory exercises conducted under each topic is as follows:

Polarisation

POL

The polarisation module enables students to carry out the following experimental investigations: alignment of polariser/analyser combination & confirmation of Malus' law; examination of the properties of half and quarter wave plates (alignment, axes identification, polarisation characteristics); investigation of the state of polarisation of a light wave, Stokes parameters and the polarisation ellipse with linear polarisation, elliptical polarisation and arbitrary wave plate; examination of strain birefringence and its application to strain sensing.

Reflection and Refraction

R&R

With the R&R module students undertake the necessary measurements to confirm Snell's law; determine the reflection coefficient of both an internal and external optical interface for both vertical and horizontal polarisation configurations; experimental confirmation of the Fresnel equations and identification of such features as Brewster's angle, the critical angle and total internal reflection. From the measurements they determine the refractive index of an optical element.

Diffraction

DIFF

The diffraction module enables investigation of near and far field diffraction patterns for apertures and slits of various dimensions (Fraunhofer and Fresnel diffraction); confirmation of the width of various known slits and apertures and determination of the width of unknown slits and apertures; experimental investigation of diffraction at a reflective grating, including the basic grating equation (confirmation of grating line density), multiple order diffraction, the Littrow configuration, and grating resolution and resolving power as a function of incidence angle and diffraction order using two wavelengths; determination of the wavelength of a second laser, diffraction through a transmission grating and measurement of line spacing.

Interference and Coherence

I&C

With the I&C module students construct and align a Michelson interferometer and investigate its multiple and single fringe alignment configurations. They then assess the surface quality of three different optical elements inserted into one arm of the interferometer and calculate the wedge angle for one of the elements. They proceed to investigate the coherence function of a He-Ne and also a Fabry-Perot cavity laser and then examine the coherence length of the Fabry-Perot cavity laser as the laser's drive current is varied. The students then determine the coherence length of the laser and measure its cavity length.

Applications of Basic Optics

An add-on module enabling the investigation of the basic principles of optical waveguiding is also available (see WAVE data sheet).

Product Description

The product is based on an optical rail and mounting system. All optical rails, opto-mechanical mounts and translation stages are provided as appropriate for the various experiments together with all of the optical and optoelectronic elements, such as: laser sources, optical detectors, polarisers, waveplates, pinholes, slits, diffraction gratings, mirrors, lenses, beam splitters, test optical elements, etc. In addition, a linear photodiode array is provided for the measurement of diffraction patterns from apertures and for fringe measurements in the interferometry experiments. A full literature support package is included for the student and instructor.

Additional required equipment:-

- A two channel laboratory oscilloscope with a minimum bandwidth of 20MHz is required for some diffraction and interference experiments.

Ordering Information

POL	Polarisation Module	DIFF	Diffraction Module
R&R	Reflection & Refraction Module	I&C	Interference & Coherence Module
ED-OPTICS (Modular)	Principles of Physical Optics (includes all equipment to perform experiments in 4 modules sequentially)		
ED-OPTICS (Complete)	Principles of Physical Optics (includes all equipment to perform experiments in 4 modules simultaneously)		

Please contact OPTOSCI for further details and prices of the various optional modules, combinations of modules, or other add-on modules you may require.

Since OPTOSCI are committed to continuously improving the design and performance characteristics of our products these specifications are subject to change without notice.

Date: March 2018