



Education

The Ocean Optics Education Division provides cost-effective, easy-to-use spectrometers, software and accessories for your teaching lab. We also provide curricula, workshops and multimedia learning to help you bring excitement to the classroom. Our educational offerings take your students beyond traditional technology and into the possibilities of the future.

When you invest in Ocean Optics for your teaching lab or educational application, you tap into the collective power of over 150,000 spectrometers' worth of application know-how.



Tip

As a long-time supporter of science and spectroscopy in the classroom, Ocean Optics offers funding resources to public and private teaching institutions. Grant funds are available for promoting the use of spectroscopy measurement tools in science and engineering curricula. Hundreds of institutions have benefitted from our support.

CHEM4 Spectrometers

Smart Systems for Education

The CHEM4 Series Spectrometers from Ocean Optics are small, PC-based systems that are ideal for science and chemistry educators in the classroom or the teaching laboratory. These fully integrated systems include spectrometer, light source and cuvette holder and are available at reasonable pricing for qualified educators and learning institutions.

For bringing the excitement of learning to your classroom or teaching lab, nothing is easier.

USB for Easy Startup

The spectrometers feature a USB interface and are fully calibrated. Just plug and play.

Programmable Microcontroller

CHEM4 Series Spectrometers feature an onboard microcontroller that delivers incredible flexibility and control with your system and accessories. Through a 22-pin connector, you can implement operating parameters in your software, control light sources, create processes and retrieve information on external objects.

Light Source and Sample Holders

CHEM4 Fiber Systems come with a spectrometer, an integrated sampling system and an optical fiber.

CHEM4-UV-FIBER

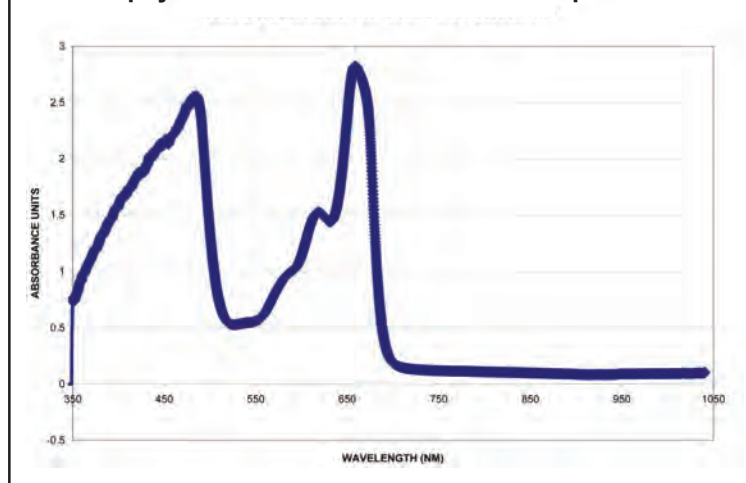
The CHEM4-UV-FIBER is ideal for absorbance measurements and combines a USB4000 Spectrometer with modular accessories including an ISS-UV-VIS Integrated Sampling System, a 300 μm solarization-resistant optical fiber and a 1-cm cuvette holder.

Item Code: CHEM-4-UV-FIBER



Spectrometer	USB4000
Wavelength range:	200-885 nm
Light source and sample holder:	ISS-UV-VIS integrated deuterium tungsten halogen light source and cuvette holder for 1-cm square cuvettes
Optical fiber:	Light source/sample holder connects to spectrometer via 300 μm solarization-resistant fiber
Software:	SpectraSuite (available for an additional charge) Overture (no charge)

Chlorophyll Absorbance with CHEM Series Spectrometer



CHEM4-VIS-FIBER

Our CHEM4-VIS-FIBER is perfect for relative irradiance and emission measurements. The CHEM4-VIS-FIBER combines our USB4000 Spectrometer with an ISS-2 Integrated Sampling System, a 400 μm optical fiber and a 1-cm cuvette holder. Add accessories like reflectance probes or dip probes for even more measurement options.

Item Code: CHEM4-VIS-FIBER



Spectrometer	USB4000
Wavelength range:	430-990 nm
Light source and sample holder:	ISS-2 integrated tungsten halogen light source and cuvette holder for 1-cm square cuvettes
Optical fiber:	Light source/sample holder connects to spectrometer via 400 μm fiber
Software:	SpectraSuite (available for an additional charge) Overture (no charge)

ChemUSB Spectrometer

Smart Systems for Education

Our CHEMUSB4 Spectrometer Systems are the ideal combination of our USB-interface spectrometer technology and modular accessories. This system is made up of our popular USB4000 spectrometer, a deuterium tungsten halogen or tungsten halogen and LED light source and 1-cm cuvette holder.

With its high-speed electronics and small footprint, the CHEMUSB4 makes a perfect teaching tool in the classroom or lab.

The CHEMUSB4-UV-VIS covers the 210-880 nm range at 1.0 nm (FWHM) optical resolution and the CHEM4-VIS-NIR covers 370-985 nm at 1.0 nm resolution.

- Fully integrated, preconfigured system
- Small footprint
- Fast, hassle-free spectrometer-to-PC connection

Item Codes: CHEMUSB4-UV-VIS, CHEMUSB4-VIS-NIR



CHEMUSB4-UV-VIS

Physical	
Spectrometer dimensions:	89.1 mm x 63.3 mm x 34.4 mm
Spectrometer weight:	190 g
Light source dimensions:	89.1 mm x 77.79 mm x 34.4 mm
Light source weight:	200 g
Detector Specifications	
Detector:	Toshiba TCD1304AP Linear CCD array
Pixels:	3648 pixels
Pixel size:	8 μm x 200 μm
Pixel well depth:	100,000 electrons
Sensitivity:	130 photons/count at 400 nm; 60 photons/count at 600 nm
Optical Bench	
Design:	f/4, Asymmetrical crossed Czerny-Turner
Focal length:	42 mm input; 68 mm output
Entrance aperture:	25 μm wide slit
Spectroscopic	
Wavelength range:	210-880 nm
Optical resolution:	1.0 nm FWHM
Signal-to-noise ratio:	300:1 (at full signal)
A/D resolution:	16 bit
Dark noise:	50 RMS counts
Integration time:	3.8 ms to 10 seconds
Dynamic range:	3.4×10^6 (system), 1300:1 for a single acquisition
Stray light:	<0.05% at 600 nm; 0.10% at 435 nm
Light Source/Sample Holder	
Light source:	Deuterium tungsten
Bulb life (hours):	800 deuterium; 2,000 tungsten

CHEMUSB4-VIS-NIR

Physical	
Spectrometer dimensions:	89.1 mm x 63.3 mm x 34.4 mm
Spectrometer weight:	190 g
Light source dimensions:	40.7 mm x 88.8 mm x 34.1 mm
Light source weight:	130 g
Detector Specifications	
Detector:	Toshiba TCD1304AP Linear CCD array
Pixels:	3648 pixels
Pixel size:	8 μm x 200 μm
Pixel well depth:	100,000 electrons
Sensitivity:	130 photons/count at 400 nm; 60 photons/count at 600 nm
Optical Bench	
Design:	f/4, Asymmetrical crossed Czerny-Turner
Focal length:	42 mm input; 68 mm output
Entrance aperture:	25 μm wide slit
Spectroscopic	
Wavelength range:	370-985 nm
Optical resolution:	1.0 nm FWHM
Signal-to-noise ratio:	300:1 (at full signal)
A/D resolution:	16 bit
Dark noise:	50 RMS counts
Integration time:	3.8 ms to 10 seconds
Dynamic range:	3.4×10^6 (system), 1300:1 for a single acquisition
Stray light:	<0.05% at 600 nm; 0.10% at 435 nm
Light Source/Sample Holder	
Light source:	Tungsten halogen and violet LED
Bulb life (hours):	2,000 (tungsten); 45,000 (LED)

Red Tide Spectrometers

Flexible, Low-Cost, Ideal for Education

USB-650 Red Tide Spectrometers are low-cost, small-footprint spectrometers designed especially for teaching labs and educational use. Red Tide Spectrometers are preconfigured with a 25 μm slit and gratings for UV-VIS (200-880 nm) or VIS-NIR (350-1100 nm) wavelengths. Red Tide models are available that couple to optical fibers and other accessories (USB-650 and USB-650-UV) and that include cuvette holder-light source combinations that attach directly to the spectrometer (USB-650-UV-VIS and USB-650-VIS-NIR).

Red Tide Spectrometers are comparable to our CHEMUSB Spectrometers, but with one significant difference: the Red Tide has fewer detector pixels – 650 active pixels – which results in approximately one data point per nanometer (CHEMUSBs have 2048-pixel detectors). This is one reason why Red Tide is not recommended for more demanding applications such as absolute irradiance measurements. For basic absorbance and other lab measurements, Red Tide is an excellent, economical choice.

Red Tide operates via Overture or SpectraSuite Spectroscopy Operating Software, which runs in OS X, Linux and Windows. The Chemistry module for SpectraSuite includes features for educational use, such as a Beer's Law calculator for absorbance experiments. Overture is a simplified software package aimed at beginners.



USB-650-UV/USB-650 Red Tide Spectrometers

- Can be easily coupled to fibers and accessories
- Compatible with PASCO's Xplorer GLX
- Compatible with Vernier's Logger Pro Software

Item Code: USB-650-UV, USB-650



USB-650-UV-VIS Red Tide Spectrometer

- Observe changes as small as 0.1 absorbance units
- Direct-attach deuterium tungsten light source and sample holder
- Plug and play operation

Item Code: USB-650-UV-VIS



USB-650-VIS-NIR Red Tide Spectrometer

- Complete system covering 350-1000 nm at 2.0 nm (FWHM) optical resolution
- Violet LED light source and sample holder
- Interfaces to PC via USB

Item Code: USB-650-VIS-NIR

Physical	
Dimensions (in mm):	89.1 x 63.3 x 34.4
Weight:	190 g
Detector	
Type:	Linear silicon CCD array
Pixels:	650 enabled pixels
Pixel size:	14 μm x 200 μm
Pixel well depth:	~62,500
Sensitivity:	75 photons/count @ 400 nm
Optical Bench	
Design:	f/4, asymmetrical crossed Czerny-Turner
Focal length:	42 mm input; 68 mm output
Entrance aperture:	25 μm wide slit
Fiber optic connector:	SMA 905
Spectroscopic	
Wavelength range:	
USB-650	350-1000 nm
USB-650-UV	200-880 nm
USB-650-VIS-NIR	350-1000 nm
USB-650-UV-VIS	200-880 nm
Optical resolution:	Model dependent
Signal-to-noise ratio:	250:1 (at full signal)
A/D resolution:	12 bit
Dark noise:	3.2 RMS counts
Dynamic range:	8.5 x 10 ⁷ (system); 1300:1 for a single acquisition
Integration time:	3 ms to 65 s (15 s typical max)
Stray light:	<0.05% @ 600 nm; <0.10% @ 435 nm
Corrected linearity:	>99%
Computer	
Operating systems:	Windows XP/7, Mac OS X and Linux w/USB port
Operating software (required):	SpectraSuite Spectroscopy Software Overture Spectroscopy Software

EduPack Kits for Teaching

Complete Kits for Your Classroom or Lab

Our EduPacks give you a convenient tool for bringing the excitement of spectroscopy to your science classroom. Each kit contains the perfect combination of equipment and curricula to help you deliver a more interesting and memorable learning experience for your pupils.



EDU-CHEMPACK

Developed for Chemistry Labs

- USB650-VIS-NIR Red Tide Spectrometer
 - SpectraSuite Spectroscopy Operating Software
 - Applications in Spectroscopy Curricula on CD or Booklet
- Item Code: EDU-CHEMPACK

EDU-PHYSPACK

Developed for Physics Labs

- USB650 Red Tide Spectrometer
 - P400-2-VIS-NIR Fiber
 - SpectraSuite Spectroscopy Operating Software
 - Applications in Spectroscopy Curricula on CD or Booklet
- Item Code: EDU-PHYSPACK

EDU-CHEMPACK-UV

Developed for Chemistry Labs

- USB650-UV-VIS Red Tide Spectrometer
 - SpectraSuite Spectroscopy Operating Software
 - Applications in Spectroscopy Curricula on CD or Booklet
- Item Code: EDU-CHEMPACK-UV

EDU-PCPACK

Developed for Chemistry and Physics Labs

- USB650-VIS-NIR Red Tide Spectrometer
 - Optical Fiber
 - SpectraSuite Spectroscopy Operating Software
 - Applications in Spectroscopy Curricula on CD or Booklet
- Item Code: EDU-PCPACK



Beer's Law

Beer's law says that absorbance of a molecule or solution is: $A_{\lambda} = bc/\epsilon_{\lambda}$

Beer's Law follows that: A_{λ} is the absorbance, ϵ is the absorptivity (mole per cm), b is the pathlength (in centimeters) and c is the concentration (molar). Absorbance is linearly proportional to the thickness of the sample, the concentration of the absorbing medium and the absorptivity, which is a measure of a given molecule's ability to absorb light.

Educational Accessories

Round Out Your Lab Right



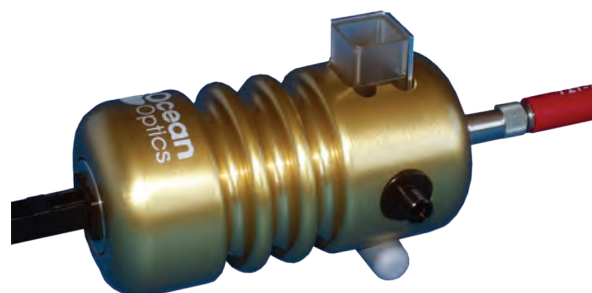
Transmission Dip Probes

Our Transmission Dip Probes are perfect for absorbance and transmission measurements and are especially useful for embedding into process streams for in situ, real-time monitoring. More on page 143.

Item Code	Description
T300-RT-UV-VIS	Transmission Dip Probe with 300 μ m diameter UV/SR optical fiber (200-1100 nm) in 6.35 mm diameter ferrule
T300-RT-VIS-NIR	Transmission Dip Probe with 300 μ m diameter VIS-NIR optical fiber (400-2500 nm) in 6.35 mm diameter ferrule
T200-RT-VIS-NIR	Transmission Dip Probe with 200 μ m diameter VIS-NIR optical fiber (400-2500 nm) in 6.35 mm diameter ferrule
RT-2MM	2 mm pathlength tip for T200-RT and T300-RT Transmission Probes
RT-5MM	5 mm pathlength tip for T200-RT and T300-RT Transmission Probes
RT-10MM	10 mm pathlength tip for T200-RT and T300-RT Transmission Probes

Miniature VIS-NIR Source

This compact, low-voltage tungsten halogen light source (400-2500 nm) with built-in 1-cm cuvette holder has a solid alloy housing that acts as a heat sink and in-line fiber ports for absorbance and fluorescence measurements. The unit has a very small footprint – 95 mm x 50 mm – and weighs just 250 g, making it attractive for lab environments where space is at a premium. The source is optimized for use with 50 μ m SMA 905-terminated optical fibers. Also included is a universal power supply with multi-plug adapter and an Allen key for simple field replacement of the bulb.



Disposable Cuvettes

Our plastic CVD-UV cuvettes are for 220-900 nm applications while our CVD-VIS cuvettes handle 350-900 applications. Both types have a 1-cm pathlength and are perfect for use with Ocean Optics educational spectrometers and, since they are disposable, no cleaning is required.

Item Code: CVD-UV1S
CVD-VIS1S



Spectral Software Made Easy

Overture is the free, Windows-based software that is perfect for new users, educators and those who need basic spectroscopy functions without the added frills. Overture performs the basics such as absorbance, transmission and emission for 32-bit and 64-bit Windows systems (XP, Vista and Windows 7). Download your copy at

<http://www.oceanoptics.com/Products/overture.asp>



Curricula

Flexible, Low-Cost, Ideal for Education

Bringing the excitement of spectroscopy to your classroom or teaching lab has never been easier. With curricula from the Education Division of Ocean Optics, you have the ideal tools for teaching and lesson-building.

An Introduction to the Spectroscopy Lab	
EDU-SPEC-BOOK	Printed version of <i>An Introduction to the Spectroscopy Lab</i>
EDU-SPEC-BOOK-S	Printed version of <i>An Introduction to the Spectroscopy Lab</i> when purchased with a spectrometer
EDU-SPEC-CD	CD version of <i>An Introduction to the Spectroscopy Lab</i> (PDF file format) and includes how-to video for making basic measurements
EDU-SPEC-CD-S	CD version of <i>An Introduction to the Spectroscopy Lab</i> (PDF file format) and includes how-to video for making basic measurements; when purchased with a spectrometer
EDU-SPEC-D	Online version of <i>An Introduction to the Spectroscopy Lab</i> in PDF file format.

Applications in Spectroscopy	
EDU-SPEC-B-APP	Printed version of <i>Applications in Spectroscopy</i>
EDU-SPEC-B-S-AP	Printed version of <i>Applications in Spectroscopy</i> when purchased with a spectrometer
EDU-SPEC-CD-AP	CD version of <i>Applications in Spectroscopy</i> (PDF file format) and includes how-to video for making basic measurements
EDU-SPEC-CD-S-AP	CD version of <i>Applications in Spectroscopy</i> (PDF file format); when purchased with a spectrometer
EDU-SPEC-D-APP	Online version of <i>Applications in Spectroscopy</i> (PDF file format)

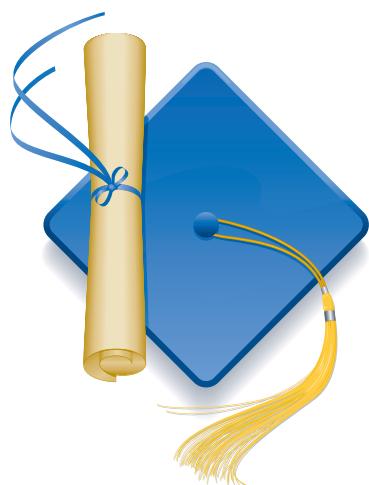
Spectroscopy 101 Workshop Manual - Biology and Life Sciences	
EDU-SPEC-B-BIO	Printed version of <i>Spectroscopy 101 Workshop Manual Using Ocean Optics Spectrometers</i>
EDU-SPEC-B-S-BI	Printed version of <i>Spectroscopy 101 Workshop Manual Using Ocean Optics Spectrometers</i> when purchased with a spectrometer
EDU-SPEC-CD-B	CD version of <i>Spectroscopy 101 Workshop Manual Using Ocean Optics Spectrometers</i> (PDF file format) and includes how-to video
EDU-SPEC-CD-S-B	CD version of <i>Spectroscopy 101 Workshop Manual Using Ocean Optics Spectrometers</i> (PDF file format); when purchased with a spectrometer
EDU-SPEC-D-BIO	Online version of <i>Spectroscopy 101 Workshop Manual Using Ocean Optics Spectrometers</i>

Spectroscopy 101 Workshop Manual - SpectraSuite/Vernier Version	
EDU-SPEC-B-V	Printed version of <i>Spectroscopy 101 Workshop Manual Using Ocean Optics Spectrometers</i>
EDU-SPEC-B-S-V	Printed version of <i>Spectroscopy 101 Workshop Manual Using Ocean Optics Spectrometers</i> when purchased with a spectrometer
EDU-SPEC-CD-V	CD version of <i>Spectroscopy 101 Workshop Manual Using Ocean Optics Spectrometers</i> (PDF file format) and includes how-to video
EDU-SPEC-CD-S-V	CD version of <i>Spectroscopy 101 Workshop Manual Using Ocean Optics Spectrometers</i> (PDF file format); when purchased with a spectrometer
EDU-SPEC-D-V	Online version of <i>Spectroscopy 101 Workshop Manual Using Ocean Optics Spectrometers</i>



Educational Grant Program

Resources Promoting Spectroscopy in Curricula and Research



innovations in educational spectroscopy

The Innovations in Educational Spectroscopy Grant Program from Ocean Optics provides resources to public and private teaching institutions. The program strives to promote the use of spectroscopy as a general-purpose, broad-based measurement tool and to enable the use of modern instrumentation and technology in science and engineering curricula.

In the program's history, Ocean Optics has awarded several million dollars in funding to high schools and universities for a variety of miniature spectroscopy applications:

- Measuring the photoluminescence of polymers
- Detecting emission lines for various gas discharge tubes
- Recording absorption lines from interstellar phenomena
- Studying physiological characteristics of plants

Ocean Optics offers several grant funding options:

Program A: Funding toward proposals for extramural funds for purchasing science equipment

Ocean Optics offers funding in support of proposals to federal, state or private institutions for the advancement of research utilizing Ocean Optics products. Program A covers the customer who applies for funding from an institution such as NSF, NIH or similar body and needs to demonstrate that they have received an educational grant discount from Ocean Optics. Most awards represent a discount of approximately 5% of the order amount.

Program B: Funding for purchasing science equipment to develop science and engineering curricula

We offer educational discounts toward the purchase of Ocean Optics products to be used expressly for developing new science and engineering curricula. Funding levels will vary according to the product, but typically start at 5%. Higher percentage awards are available for grantees that develop curricula, experiments and related material and provide these materials to Ocean Optics for posting at our website and in other media. This provides other educators with free and unrestricted access to the information. Awards will be granted based on the strength of the applicant's technical proposal and the originality of the proposed curricula.

Grant Application Guidelines

All grant applicants must complete an Educational Grant Application. Applications are available at www.oceanoptics.com/corporate/grantapplication.pdf.

