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Photonics Educator Kits

Product Description:

OptoSci's photonics educator kits are a unique range of fully self-contained laboratory teaching packages for use in universities, colleges, and industrial training centres. These innovative products offer the tutor an immediate solution to the provision of comprehensive and stimulating experimental courses in key areas of optics, optoelectronics, and optical communications. The current educator kits are

- Optical Waveguiding & Fibre Optics
- Fibre Optic Communications & BER
- *Fibre Amplifiers & Lasers*
- Physical Optics
- Optical Network Analysis - OTDR
- *WDM Systems & Bragg Gratings*

The kits are designed in conjunction with senior academics from the internationally renowned optoelectronics teaching and research groups at Strathclyde and Heriot-Watt Universities to ensure high quality products that are directly relevant to teaching or training courses in this technological field.

Each package is a fully self-contained unit incorporating all of the components and optoelectronic instruments required to perform the experiments. In addition, extensive literature support is provided including: student manuals which describe the relevant background theory and experimental procedures; instructor's manual with sample results for all experiments; detailed background / lecture notes with case studies, design exercises and tutorials with solutions.

Product's Unique Features:

- Each educator kit is fully self-contained providing the tutor with all of the experimental equipment and literature support to immediately establish a teaching laboratory in key areas of photonics technology, in addition to providing extensive teaching material for the associated lecture course. Thus these packages save the tutor significant course, literature and hardware development effort.
- OptoSci's innovative design philosophy ensures: that all of the educational objectives are realised; that all major technical issues are addressed; and that each complete package can be offered for a price which is realistic within academic budgets.

Features & Benefits Summary

| FEATURES | BENEFITS |
|---|---|
| Fully self contained package | Saves significant course, literature and hardware development |
| Competitively priced | Available for a price which is realistic within academic budgets |
| Innovative system design with all specialised experimental hardware supplied | Allows immediate installation in the laboratory and compatible with standard laboratory test instruments |
| Comprehensive laboratory literature support | Full background and experimental support for tutor and student |
| Full background / lecture notes and tutorials provided | Provides extensive background material for lecture course |
| Designed in conjunction with leading academics from Strathclyde & Heriot-Watt Universities | Totally relevant to photonics courses in academia |
| Easily tailor experimental programme for different student levels | Suitable for all university undergraduate and masters level photonics courses in Physics and Electronic Engineering |
| Kits examine fundamental principles, key technical issues & applications of the technology | Straightforward to reconfigure for open ended projects & problem based learning labs |
| Innovative design philosophy | Ensures that all desired educational objectives are realised and that students investigate all major technical issues |
| Over a thousand kits are currently used in leading academic institutions world-wide and we experience continued repeat business | Positive endorsement of the educational value of the products by both tutors and students |
| Full product support is available | Just contact us by e-mail or phone |

Benefits of OptoSci's Kits

1. OptoSci's unique range of self-contained photonics laboratory teaching packages offer an immediate solution to the provision of comprehensive and stimulating experimental courses in key areas of optics, optoelectronics, and optical communications. Consequently these educational packages save the university tutor 2 to 3 years of course, literature, and hardware development effort.
2. To enable rapid installation in the laboratory and remove the need for costly design and development of the laboratory hardware, each OptoSci package is a fully self-contained unit incorporating all of the specialised components and optoelectronic instruments required to perform the experiments. The only additional items required are usually standard laboratory instruments like: oscilloscopes and function generators.
3. To eliminate any time consuming and expensive preparation for the tutor extensive literature support is provided including, student manuals which describe the relevant background theory and experimental procedures, and an instructor's manual with sample results for all experiments and exercises.
4. To assist with the preparation of the corresponding lecture course, each educator kit is accompanied by a comprehensive set of lecture notes (incorporating examples, design studies, and tutorial questions and solutions) detailing the underlying principles behind the laboratory experiments.
5. To ensure high quality educational products which are directly relevant to academic courses in photonics, OptoSci design the kits in close collaboration with senior academic staff from the internationally renowned optoelectronics teaching and research groups at Strathclyde and Heriot-Watt Universities.
6. To consolidate what the students have learned in their lectures, each educator kit is designed to enable students to investigate the important physical principles and key technical issues relevant to the particular topic of interest.
7. In certain circumstances the tutor may wish to provide open ended experiments to challenge the more advanced university student (i.e. for final year undergraduate projects or MSc project based experiments). Since the OptoSci educator kits are designed to enable students to investigate important physical principles and key technical issues, it is relatively straightforward to use the equipment for such open ended experiments.
8. OptoSci's innovative design philosophy ensures: that all of the educational objectives are realised; that all major technical issues are addressed; and that each complete package can be offered for a price which is realistic within academic budgets.
9. Over a thousand OptoSci kits are used in the teaching laboratories of leading academic institutions world-wide. The positive feedback we have received from both tutors and students alike is an emphatic endorsement of the educational value of the products.

Educator Kit Design Philosophy

To satisfy the growing demand of the optoelectronics industry for skilled engineers, scientists, and technical staff, numerous colleges and universities world-wide have introduced courses in optoelectronics and optical communications at graduate and post graduate level. Such courses require the support of laboratory based programs to enable the students to acquire practical familiarity with optoelectronics principles, components and systems.

Despite the obvious need, very little dedicated hardware for photonics teaching laboratories is commercially available. What is available tends to simply demonstrate some features of the technology (and in most cases these are limited to very basic features) rather than enabling students to investigate important physical principles or key technical issues. In many instances the general approach taken within academic institutions, and also by most commercial suppliers, is to design student experiments around existing optoelectronic hardware, probably originally conceived for the research or industrial markets. The result of this approach is that the educational objectives and issues addressed in the ensuing laboratory experiments are dictated by the available equipment. Often, therefore, the demonstration or investigation of certain key technical issues and principles are excluded, implying that the desired educational objectives are not realised.

OptoSci recognise that it is essential to have a fully integrated approach to the design of laboratory based photonics education packages, including: the design of dedicated hardware, experimental procedures, exercises and manuals. Therefore to ensure high quality educational products, OptoSci, in close collaboration with senior academic staff at Strathclyde and Heriot-Watt Universities, develop their kits in accordance with the following strict design philosophy:

- Define the educational objectives in terms of the physical principles, key technical features, design issues and performance characteristics which must be addressed to complement the associated lecture course.
- Define and design the experiments to realise these objectives.
- Design the dedicated (custom) hardware to enable the proposed experimental investigation.
- Formulate the experimental procedure and instruction manuals to guide the tutor and the students through the investigation and results analysis (in most cases more open ended investigations may also be formulated with minimal guidance given to the students).
- Prepare the associated lecture notes, and formulate tutorial exercises and case studies to relate the results to real world devices and systems.

This innovative approach ensures: that all of the educational objectives are realised; that all major technical issues are addressed; and that each complete package can be offered for a price which is realistic within academic budgets.

Frequently Asked Questions on the Educator Kits

1. *Are the educator kits self-sufficient?*
2. *Number of students per experiment?*
3. *How much assistance will the students need?*
4. *Time taken for the experiments?*
5. *Can the experiments be open ended?*
6. *How are the OptoSci educator kits different from other commercial kits?*

1. *Are the educator kits self-sufficient?*

To eliminate any time consuming and expensive preparation for the tutor, each package is a fully self-contained unit incorporating all of the components and optoelectronic instruments required to perform the experiments. In addition, extensive literature support is provided including, student manuals which describe the relevant background theory and experimental procedures, and an instructor's manual with sample results for all experiments and exercises. Hence, the tutor is supplied with all of the material necessary to enable these kits to be directly installed in the teaching laboratory for the student's use. Furthermore, to assist with the preparation of the corresponding lecture course, each educator kit is accompanied by a comprehensive set of lecture notes (incorporating examples, design studies, and tutorial questions and solutions) detailing the underlying principles behind the laboratory experiments.

Therefore, once the tutor has performed all of the experiments and compared his results with those given in the instructor's manual, the educator kit can be installed within the laboratory and the students allowed to work through the experiments using the student laboratory manuals.

Where appropriate and cost effective, some of the kits may require the use of standard instruments normally available in student laboratories (e.g. a 20 or 50MHz oscilloscope). If any additional equipment is required it will be noted on the individual data sheets.

2. *Number of students per experiment?*

Usually it is arranged that students will perform the experiments individually, in groups of two (preferred) or three (maximum) at any one time. The exact number of students per kit will be decided by the tutor depending on class size, and time available for the laboratory course.

3. *How much assistance will the students need?*

All of the information required for performing the experiments (i.e. background theory, operational instructions, and experimental procedure) is included in the student manuals. Therefore by following the laboratory manual (which ideally should be read before coming into the laboratory), the student should only require minimal assistance from the tutor / demonstrator while performing the experiments. In addition, because the necessary theory is covered in the manual, the students will have a good understanding of the principles addressed in the experiments, even if they have not yet covered them in their lecture course.

4. Time taken for the experiments?

With minimal assistance from the tutor / demonstrator, it is generally arranged that the students can complete all of the experiments in each kit, typically, in six hours (e.g. two laboratory sessions), provided they have read over the student manual prior to the laboratory session. Further analysis of the experimental results, and other exercise work included in the manuals is completed outside of this time. To reduce the time taken to complete the experiments, the lecturer can provide additional guidance while the students are performing the experiments, and / or select the most relevant experiments to suit the particular lecture course.

5. Can the experiments be open ended?

In certain circumstances the tutor may wish to provide open ended experiments to challenge the more advanced student (i.e. for final year undergraduate or MSc project based experiments). Since the OptoSci educator kits are designed to enable students to investigate important physical principles and key technical issues, it is relatively straightforward to use the equipment for such open ended experiments. Thus the tutor would provide the students with minimum background information and could ask them, for example, to make all of the necessary measurements and interpret them appropriately to determine the following:

(a) Two control terminals 3.2 km apart on a large industrial site require to communicate at 5Mbit/sec. Make all the necessary measurements on the ED-COM system provided to determine if it could meet this specification simply by extending the cable length.

or,

(b) Make all of the necessary measurements on the waveguides provided with ED-WAVE and carry out the appropriate analyses to determine the design and manufacturing parameters to realise a waveguide which supports a only a single TE polarisation mode at 632nm. Assume that you will use the same manufacturing technique as the waveguides provided.

6. How are the OptoSci photonics educator kits different from other commercial kits?

As discussed in Q.1 above, OptoSci's range of self-contained photonics laboratory teaching packages offer the tutor an immediate solution to providing a comprehensive and stimulating laboratory based course examining the fundamental principles, enabling technologies, and practical applications in key areas of optics, optoelectronics, and optical communications. Consequently these educational packages save the tutor 2 to 3 years of course, literature, and hardware development effort.

OptoSci, to the best of our knowledge, is the only supplier offering such a comprehensive laboratory teaching package in this area. Other commercially available photonics "teaching" equipment tends to simply demonstrate some features of the technology (and in most cases these are limited to very basic features), rather than enabling students to investigate the important physical principles and key technical issues relevant to their lecture course. In fact, in our opinion, what the competition offers is of trivial value for teaching students about the critical technological issues covered in academic courses in photonics. As an example, in our experience, none of the competition (with so called fibre communications kits) allows you to experimentally investigate the key issues of attenuation and dispersion (both material and modal) and to determine how they limit the overall performance of a fibre communications system. OptoSci's ED-COM system enables the students to investigate these key points with only the addition of a standard 50MHz oscilloscope.

Furthermore, the general approach taken by many commercial suppliers, is to design student experiments around existing optoelectronic hardware, probably originally conceived for the research or industrial markets. The result of this approach is that the educational objectives and issues addressed in the ensuing laboratory experiments are dictated by the available equipment. Often, therefore, the demonstration or investigation of certain key technical issues and principles are excluded, implying that desirable educational objectives are not realised.

OptoSci recognise that it is essential to have a fully integrated approach to the design of laboratory based photonics teaching packages, including: the design of dedicated hardware, experimental procedures, exercises and manuals. Therefore to ensure high quality educational products, OptoSci, in close collaboration with senior academic staff at Strathclyde and Heriot-Watt Universities, develop their kits in accordance with a strict design philosophy of, firstly, defining the educational objectives in the context of the associated lecture course, formulating the experimental investigation to achieve these objectives, and, finally, designing the custom hardware and support literature to enable that investigation.

This innovative approach ensures: that all of the educational objectives are realised; that all major technical issues are addressed; and that each complete package can be offered for a price which is realistic within academic budgets.



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