

# Photonics Academy at OpTIC

PERCEIVING ENLIGHTENING PHOTONICS

## ***Initiative***

A Laser Photonics Presentation and Tutorial facility recently has been established within OpTIC, as a central feature of the introduction of the Photonics Academy at OpTIC. This newly located facility includes a permanent display of a selection of twenty-five working low-power Laser Photonics Projects. Each of these Projects has been designed and constructed by individual students, in the range of 15 – 25 years of age, during the provision of opportunities for an involvement in such Projects. In just over a decade of the availability of such student opportunities, almost two-hundred different Projects have been undertaken. Each Project incorporates different configurations of Laser Photonics concepts, with most of the Projects forming working prototypes of a highly innovative nature. Each of these Projects highlights the tremendously versatile nature of the Laser Photonics concepts that the students have analysed, adapted, and applied, in highly imaginative ways.

## ***Activation***

These Laser Photonics Projects form a tremendously valuable resource at OpTIC, and they provide the main focal point of this optically based initiative, that specifically seeks to activate, to encourage, and to increase the awareness of students to the whole realm of valuable Photonics principles and opportunities. Additionally, these Photonics Project opportunities provide a prolific environment for the implementation of a range of highly esteemed personal skills, which include the recognition and realization of an individual student's insight, imagination, and ingenuity. The acquisition of such personal skills embraces significantly important implications, which directly affect the student's own personal future, as well as impinging upon the future of a wide range of technologies from within Science and Engineering. Such Laser Photonics Project opportunities bring to the fore some of the highly innovative potential that certainly exists within the imaginative thinking, and the potential involvement, of so many 21<sup>st</sup> Century students when provided with opportunities to develop their inherent and potential skills and talents within this 21<sup>st</sup> Century technology.

## ***Interest***

There is clear evidence that a Student acquires a tremendous sense of personal achievement in becoming involved with the creation of a Photonics Project. Raising a Student's awareness of the relevance and adaptability of Photonics concepts proves to be an extremely worthwhile undertaking for a participating student, irrespective of their level of interest at the start of such a Project. Indeed, many Project case histories have commenced with a student finding Science of little, or even zero, interest to them, but for whom their involvement with a Photonics Project completely reverses their initial opinion. Some of these students are now studying Physics, or Engineering, at University. On the other hand, there are many other Project case histories that highlight students, who initially are greatly attracted towards Science in their Sixth Form, or at University, but for whom, after experiencing an encounter with a Photonics Project, there is a realization that their interest in Science is enhanced to a higher level than even they imagined was possible.

## ***Projects***

The existing Photonics Project designs highlight a rapidly advancing list of applications of low power Laser Photonics concepts that are visually demonstrated through novel instrument outcomes. Their range spans a very wide spectrum of Photonics applications, stretching from Fibre Optic Laser seismographs, through various Laser Photonics devices to aid visually impaired people, to an array of Laser Photonics activated mobile Robots, one of which involves an Award winning Laser Speckle activated Robotic Hand. The encouragement to engage in the production of a viable Laser Photonics Project offers a student an opportunity to acquire personal experience, and skills, in the design and construction techniques that are fundamental to many of the procedures that are essential for, and relevant to, the challenges that arise within so many aspects of 21<sup>st</sup> Century Science, Medicine, and Engineering.

### ***Opportunities***

The Photonics Academy at OpTIC is developing a programme of Photonics Awareness opportunities for Students and their Tutors, through educational initiatives that will continue to highlight the tremendously versatile, and the particularly accessible, world of low power Laser Photonics principles. Through Invitation Visits for Teachers of scientific subjects, as well as non-scientific subjects, the policy of collaboration in depth with Schools right ***across the Curriculum*** will provide opportunities to reveal the way in which Photonics Projects can be of interest to Students at all levels, and of all academic disciplines.

### ***Significance***

This Photonics based collaboration with Schools is helping to assist Students with their formal GCSE and A Level Science courses in their respective Schools. However, the ***across the Curriculum*** approach to Schools is opening up some extremely worthwhile investigative opportunities for many more Students than those who already find Science to their liking. The inherently innovative nature of the Photonics Projects already have given rise to Business Plan Study opportunities for AS and A2 Sixth Form Students who may not initially intend to follow any Science or Engineering Courses in FE or HE Colleges.

### ***Outreach***

The Photonics Academy at OpTIC also is involved in Master Class Presentations, both at OpTIC as well as in a number of host Schools, in which student participation highlights the many Photonics concepts and opportunities that can be made available for Students to become involved with low power Laser Photonics Projects. Some Schools already have shown a practical interest in their students undertaking Photonics Project work within their own Schools. With the increasing inclusion of Photonics concepts within each School Curriculum Syllabus, this collaboration with Schools is certain to increase. This recent Photonics outreach initiative is resulting in the Project experience of the Photonics Academy at OpTIC being shared with educational groups that are outside of the actual local environment of OpTIC in North Wales.

### ***Phases***

The five distinct phases of a student's performance in these Photonics Project involvements are:-

- ❖ An initial detailed analysis is prepared for the specific requirements arising from an initial idea for a Project that has arisen from, or been prompted by, some everyday experience or encounter.
- ❖ A Design Specification is established that will create a viable solution to this particular challenge of creating a novel device that will utilize one, or more, characteristics selected from Photonics concepts.
- ❖ Various empirical investigations are carried out to verify that appropriate values will be available to support the feasibility of the proposed Photonics parameters to fulfil the requirements that have been envisaged for the solution provided by this particular Project.
- ❖ With the above positive confirmation in place, the construction of the Opto-electronics circuits, together with all of the mechanical and optical components, is commenced, with an emphasis on systematic testing procedures much in evidence for each individual circuit, or component, when it is completed.
- ❖ The complete assembly, and linking, of all of the individual components leads to the final testing procedures for the completed Project, a table-top Presentation of the Photonics Project to demonstrate that it achieves its intended performance, and the Presentation of a full Photonics Project Report that is based upon the Laboratory Log Book record that the student has maintained for all phases of the Project.

### ***Conclusion***

All of these educational initiatives are being undertaken by the Photonics Academy at OpTIC specifically to encourage students to become more aware of, and more interested in, the Laser Photonics principles and concepts that can be made accessible to them in highly practical ways. These 21<sup>st</sup> Century students will discover that this enabling Photonics knowledge forms an extremely valuable preparation for their inevitable encounters with the rapidly developing outcomes that emerge from within the life sustaining worlds of Science, Medicine and Engineering, which all incorporate 21<sup>st</sup> Century Photonics concepts.

### ***Anticipation***

The Photonics Academy at OpTIC is actively seeking a development of collaborative partnerships with those establishments that are similarly seeking to encourage young students towards an increased awareness of, and interest in, the highly significant role that Photonics plays within all technologies of the 21<sup>st</sup> Century. Knowledge and experience in Photonics create implications that are particularly ***enlightening***.

**Photonics Academy at Optic**  
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