NUSOD 2007 Short Course Description SC0703

Photonic Crystal Devices and Integrated Circuits

SCOPE: Photonic crystal structures offer the ability to engineer the electromagnetic properties of materials. They do so by creating a band of frequencies over which electromagnetic radiation is forbidden to propagate within the host material. As a result, these structures can be used to confine, route, suppress, localize, split, disperse, and filter electromagnetic waves. To this end, numerous useful and interesting devices can be realized. For this reason, the emphasis of this course will be on providing a working knowledge of the basic operational physics of photonic crystal devices and of mathematical and computational design methods for their simulation. Several examples targeted at integrated photonic systems will be covered.

BENEFITS AND LEARNING OBJECTIVES

- Understand the operation of photonic crystal structures
- Use the finite-difference time-domain method for 1-D, 2-D, and full 3-D simulation and analysis of photonic crystals
- Design photonic crystal circuits and devices, including low-loss waveguide channels, sharp bends, efficient splitters, super prisms, drop filters, 3-D routing, in- and out-coupling structures, and high-Q cavities

INTENDED AUDIENCE: This course is aimed at students, researchers, and working professionals. No previous familiarity with photonic crystal devices is necessary, but a general understanding of optical physics would be helpful.

COURSE LEVEL: Introductory

INSTRUCTOR: Dennis W. Prather, Professor of Electrical and Computer Engineering at the University of Delaware, is an active researcher in the area of meso- and nano-photonic devices. He leads a research group focused on developing efficient numerical models for micro- and nano-photonic devices, as well as their fabrication using nano-lithography and DRIE methods. He is the recipient of the NSF Career Award and the ONR Young Investigator Award. He is currently a topical editor for *Optical Engineering* and has been guest editor of the SPIE milestone series.