KOÇ UNIVERSITY

Science – Math Seminar

Speaker: Cem Öztürk,
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Date: Thursday, Dec. 23, 2004
Time: 16:45 (Tea and cookies will be served at 16:30)
Place: Science building, Room Z42
Title: Chip-Scale Integrated Optics and Photonic Integrated Circuits for WDM Applications

Short Biography:

Cem Ozturk received his BSc degree in Electrical & Electronics Engineering from Bogazici University in 1995, and received his MSc and PhD degrees in Electrical & Computer Engineering from the University of California, Santa Barbara in 1997 and 2002 respectively. During his graduate studies he was the recipient of a NATO Science Fellowship, and worked as a research assistant for the MOST (Multidisciplinary Optical Switching Technology) Research Center. His PhD thesis 'Hybrid Tunable Polymer-Compound Semiconductor Devices for WDM Applications' received a GM Delco Defense Systems Inc. Science Fellowship Award. After his graduation he joined the ECE Dept. of UCSB as an Assistant Research Engineer conducting research on InP based active microresonator devices. He was a member of CSWDM (Chip-scale WDM) Research Center, and a contributor to R&D Dept. of Oplink Inc, San Jose, CA. Dr. Ozturk is currently a faculty member of the Microelectronics Group, Faculty of Engineering and Natural Sciences, Sabanci University. His research areas include Chip-scale Photonic Integrated Circuits, Optoelectronic filters and add/drop Mux/DeMux, WDM Fiber Optic Networks and Components, Ultra-high speed electro-optic and quantum well modulators, Semiconductor and hybrid integrated processing technologies, High-speed Electronics for PICs, ZnO and Si based Integrated Optics.

Abstract:

Photonics and opto-electronics is a rapidly growing field with various practical applications, such as imaging, sensing, data storage, inertial navigation, communications etc. One of the major forces driving the field is the fiber optic telecommunications applications. With the Internet spreading in a fast pace throughout the globe, fiber optics with its high capacity, bandwidth and security is almost exclusively used as the network's backbone. Single channel TDM reaching 40 Gb/s and multi-channel WDM posting Tb/s ranges impose strict constraints on the performance of the components used in the network. High speed, low loss, efficient and functional implementation of optical functions is necessary and these can best be realized using semiconductor based chip-scale integrated optics, and photonic

integrated circuits. The challenges in photonic integration include the design and realization of efficient optical device structures, integration of multiple devices on the same platform to realize functional photonic integrated circuits, and the integration of driving electronics on the optical chips.

The first part of the talk will include a general overview of the TDM and WDM fiber optic systems. Focusing on the WDM networks, necessary optical functions and examples of their chip-scale implementation will be discussed. Then a novel hybrid integration technology using polymers and compound semiconductors will be presented. Examples of hybrid device structures such as tunable filters, tunable grating reflectors for add/drop applications, high-speed electro-optic modulators and optical mode-converters and interconnects will be analyzed. The last part of the talk will focus on the integrated optical microresonators. With their compact structure and functionality these wavelength selective devices are the leading candidate as the building blocks for the photonic switching fabric of next generation networks. After a general overview of device operation, results on hybrid microdisc resonator filters and InP based active microresonator devices will be discussed. A novel active microresonator cavity design using TIR mirrors will also be presented.
