

**MATHS AND CS WITH EE**  
**MARCH 2, 2011**  
**13:30-17:10**  
**FILMZAAL, DE ZWARTE DOOS**  
**(THE MOVIE THEATER OF THE BLACK BOX CAFÉ)**

EINDHOVEN MATHEMATICS AND COMPUTER SCIENCE  
MEET THE  
DEPARTMENT OF ELECTRICAL ENGINEERING

**Speakers:** Jean-Paul Linnartz, Guid Oei, Anton Tjihuis, and Siep Weiland

**Intention:** This is a unique opportunity for mathematicians and computer scientists at TU/e to learn about exciting research going on at the Department of Electrical Engineering. Indeed, research that could use input from Maths and Computer Science, and the aim is to stimulate future collaboration.

**Programme:**

**13:30-13:35:** Ton Backx, *Opening*

**13:35-14:05:** Jean-Paul Linnartz, *Security in Body Sensor Networks*

Security as a research topic has changed over the past years. Many mathematical foundations for secure algorithms are known but most systems are broken by exploiting other weaknesses, often in the implementation or system architecture. In this talk Jean-Paul Linnartz takes the example of body sensor networks and describes some of the system challenges. Specific multi-disciplinary aspects include security algorithms that operate on noisy data, i.e. not perfectly reproducible measurements, such as biometric data. Other challenges are the connection of real-time sensor nodes with clinical decision support systems, where new performance issues appear.

**14:20-14:50:** Anton Tjihuis, *Electromagnetics: A Multidisciplinary Field with Many Possibilities for Collaboration*

Much of the technology enabling today's society is driven by electromagnetic effects. This makes the utilization of electromagnetic waves and fields a cornerstone of Electrical Engineering. Internationally, the Netherlands has a unique position in applied electromagnetic research, since it houses major players in areas such as astronomy, radar, space technology, EMC/EMI, bio-electromagnetics, optical fibers and components, RF technology, and lithography. The electromagnetics group at TU/e contributes to this position by developing new modeling strategies that enable the analysis and design of complicated three-dimensional structures that are representative of these applications, and applying state-of-the art modeling to applications that are of interest to our partners. In this lecture, the state of the art will be discussed, and research questions for possible collaboration will be formulated.

**15:10-15:40:** Guid Oei, *Safer Childbirth: A Technical Challenge*

Pregnancy and childbirth are among human's most dangerous life events. The risk of death or persistent damage is high. What are the most common complications and how can we help to prevent these problems.

**16:00-16:30:** Siep Weiland, *On Model Approximation for Multidimensional Systems*

Dynamical systems that evolve over space and time are notoriously difficult to simulate. Typically, finite element or finite volume methods are used to discretize such systems. With increasing demands on accuracy, the complexity of such models may increase beyond feasible limits of computation time. In these cases, model reduction tools are helpful to simplify models. In this presentation we discuss the use of tensor decompositions to approximate systems that evolve over multiple independent variables. Examples will illustrate the theory.

**16:30-17:00:** Further informal discussion.

**17:00-17:10:** Arjeh Cohen, *Closing, with view towards follow-up meetings.*

Between and after the talks there will be ample time for informal discussion with the speakers in and around Zwarte Doos' lecture rooms.