

# EAST-WEST SUMMER SCHOOLS IN MICROWAVE AND OPTICAL ENGINEERING

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## Abstract Origin

Originated by the European Union under the Tempus Programme these Summer Schools have since then grown in strength, in the mean time based on other funding schemes, with participating universities from both the E.U. and eastern Europe. So far they took place annually in Warsaw, Rome, Guilford near London, Darmstadt, Prague, Warsaw and Bratislava. The next one will be in the year 1998 in Chemnitz. Students have to work on individual projects within small fully international groups of typically 4 or 5, attend lectures and have a competitive presentation of their results, sometimes with local industry offering prizes for the best groups. The language used is English. This course is at their home universities fully accepted as satisfying the normal course requirements. The industrial response to this multicultural course experience is indeed very positive.

## Introduction

The opportunities of the globalization of the microwave-electronics markets require also special schemes of university education. The European Union has been in the midst of these requirements for many years already - ist multi-language society needed the multicultural dimension already a long time ago, and programmes such as "Erasmus" had been very successful. With the "arrival" of Eastern-Europe some 8 years ago, new funding programmes were created to incorporate these countries and "Tempus" was set up. This funds joint educational efforts of universities between countries of the European Union and those of Eastern Europe.

This then lead to the funding of a scheme covering microwave and optical engineering with a number of universities from the East and the West of Europe to regularly run Summer Schools in this field. The event is very successful and continues to grow, even in the later years without any further funding from the European Union. The main concept is high quality in an international environment. The organization is non-profit oriented in order to let Eastern-European University students and professors with their low financial possibilities to take part. The driving force is the industrial requirements of intercultural experiences required for their engineering staff. The operation of the Schools is a personal response of the participating professors with funding brought in from their universities and governments. Around 100 students of either young postgraduate level or of the last year of their Diplom-studies (equivalent to an "Master of Engineering") and around 15 Professors take part. Participating students are carefully selected by their professors at home. There is the large lecture

theatre but also a good number of small seminar-rooms and student working space. Professors and students are accommodated in university guest rooms. Since the timing of the Summer Schools is the week after the end of the lecturing semester/term at home, these guest houses are then available at the university hosting the school. Lectures are in English. The professors and students originate from around a dozen countries (see programm of last Summer School on Table). The main purpose of the courses is to present, after introductory lectures, the newest fields of microwave and optical engineering application. The content changes therefore every year to be truly a forum of the latest developments. The course generally begins with basic details of heterostructure transport, including relevant quantum mechanical effects. Then lectures come concerning new component concepts in the fields of transistors, lasers, detectors etc. This then leads over to system applications. Here a number of examples are described systematically. The presentations include always strong discussion components for the students to interact with the professors.

The Summer School is therefore an enrichment of the home curriculum, but with the experience of intercultural studying.

A major part is project work by the students within teams of 4 to 6 students of totally mixed nationalities. The projects are strongly design and modelling orientated. The teams are given full access by the host university to the library, laboratory, internet etc. It is impressive how competently and how motivated the students for example employ all the international e-mail facilities in obtaining latest component quotations from international suppliers world wide.

Typical projects concern component designs like:

1. Design, model and evaluate a microwave amplifier of 2 GHz bandwidth operating at 36 GHz, covering an output power of 3 Watt...

or

Projects can, however, also concern the

3. Design the dispersion management scheme of an optical 500 km 100 hb/s transmission link. Dispersion and attenuation measurements of standard single mode fibers and dispersion compensating fibers are given. Determine repeater spans (amplification only) if Er doped amplifiers with a gain of 30 dB are available. Compare RZ and NRZ transmission.

4. Design of a Global Positioning System using stationary Satellites for accurately positioning vehicles,

or

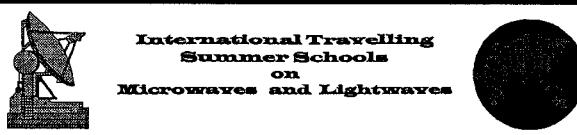
5. set up the total strategy of car-parking assistance via radar.

The projects are often financially supported with prizes by local industry like Alcatel in Bratislava during the last Summer School of 1997.

On the last day of the Summer School the teams have to give each a 20 minute presentation. A jury of professors is judging the performance and decides on the awarding of the prizes to the most successful project teams.

The total atmosphere of these summer schools of typically seven days duration is very stimulating and most enjoyable. Past participants - now well established in their own industrial positions - comment regularly with great enthusiasm.

Many new ideas are now under consideration such as continuing student-professor interaction by e-mail and per web, leading ultimately to the usage of the video lecturing facility which is now already available with some of the partner-institutions. This would likely result in video lecturing and conferencing, possibly as a continuing educational effort framing the week-long summer school.



**International Travelling  
Summer Schools  
on  
Microwaves and Lightwaves**

1991 - Warsaw, 1992 - Roma, 1993 - Guilford, 1994 - Darmstadt, 1995 - Prague, 1996 - Warsaw

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**7-th ITSS-ML**  
**FACULTY OF ELECTRICAL ENGINEERING  
AND INFORMATION TECHNOLOGY**  
**SLOVAK UNIVERSITY OF TECHNOLOGY**  
**BRATISLAVA, SLOVAKIA**  
**JULY 12 - 17, 1997**

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TABLE

9.30-10.30 Official Opening and Introduction

**Microwaves & Lightwaves - 1**

11.00-13.00 "Material Foundation of Microwaves and Optical semiconductor Devices"  
Prof. Hans Hartnagel, Technische Hochschule Darmstadt

**Microwaves & Lightwaves - 2**

14.00-15.00 "Optical Generation, Controlling and Transmission of Microwave Signals"  
Prof. Bogdan Galwas, Warsaw University of Technology

**Monday - July 14, 1997**

**Microwaves - 1**

8.30 - 9.30 "Design of Non-linear Microwave Circuits"  
Prof. Franco Giannini, University of Rome, "Tor Vergata"

9.30-10.30 "Application and Analysis of HBT Devices"  
Prof. Viktor Krozer, Technische Universität Chemnitz-Zwickau

**Microwaves - 2**

11.00-12.00 "Devices for High-Frequency Power Amplification"  
Prof. Klaus Fricke, Fachhochschule Fulda

12.00-13.00 "Transmission Line Concept for Monolithic Micro- and MM-Wave Integrated Circuits(MMIC's)"  
Dr. Klaus Beilenhoff, Technische Hochschule Darmstadt

**Microwaves - 3**

14.00-15.00 "Application of the Semiconductor Devices in Millimetre Wave Systems: Fundamental Limitation and Prospects"  
Prof. Vladimir Ljoubtchenko, Russian Academy of Sciences, Moscow

15.00-16.00 "Microwave Active Devices Characterisation"  
Dr. Giorgio Leuzzi, University of Rome, "Tor Vergata"

**Tuesday - July 15, 1997**

**Microwaves - 4**

8.30-9.30 "New RADAR Applications created by LIDAR Systems"  
Dr. Slavomir Palczewski, Warsaw University of Technology

9.30-10.30 "Medical Application of Microwaves"  
Prof. Jan Vrba, Czech Technical University, Prague

**Microwaves - 5**

11.00-12.00 "Frequency-Domain and Time-Domain Characterisation of Microwave Circuits"  
Dr. Vladimir Bilik, FEI SUT, Bratislava

12.00-13.00 "Wide-Band Microwave Impedance Measurement"  
Assoc. Prof. Karel Hoffmann, Czech Technical University, Prague

**Wednesday - July 16, 1997**

**Lightwaves - 1**

8.30-9.30 "Beam-Propagation Methods for Numerical Simulation of Waves Propagation in Photonic Structures"  
Assoc. Prof. L. Sumichrast, FEI SUT, Bratislava

9.30-10.30 "Non-linear Waves in Optical Fibers - Optical Solitons"

**Lightwaves - 2**

11.00-12.00 "Tunable Frequency Selective Receivers for Optical Wavelength Division Multiplex (WDM) Systems"  
Prof. Peter Meissner, Technische Hochschule Darmstadt

12.00-13.00 "Receivers for High-Speed Optical Fiber Communications"  
Dr. Martin Tomaska, FEI SUT, Bratislava

**Lightwaves - 3**

14.00-15.00 "Advanced Semiconductor Lasers for Optical Communications"  
Assoc. Prof. Jaroslav Kovac, FEI SUT, Bratislava

15.00-16.00 "High-Speed Photodetectors for Fiber Systems"  
Assoc. Prof. Frantisek Uhrek, FEI SUT, Bratislava

16.30-17.30 "Heterojunction Device Modelling for Electronic and Optoelectronic Applications"  
Dr. Di Carlo, University of Rome, "Tor Vergata"

**Thursday - July 17, 1997**

**Lightwaves - 4**

8.30-9.30 "Introduction to Fiber Optic Sensors"  
Dr. Martin Berta, FEI SUT Bratislava

9.30-10.30 "Solid-State Chemical Sensors"  
Dr. Corrado di Natale, University of Rome, "Tor Vergata"

**Lightwaves - 5**

11.00-12.00 "DFB Lasers for Telecommunications"  
Prof. Pawel Szczepan Sigmanski, Warsaw University of Technology

12.00-13.00 "Future of Microelectronics"  
Prof. Radehaus, Technische Universität Chemnitz-Zwickau

**Presentation of Student Group Works**

14.00-16.00 "Presentation of Final Works by Elected Representatives of Student Groups"  
Representatives of student groups