

# Course on

## RF Circuit Design and Manufacture

*Presented by Prof. Stepan Lucyszyn*

**Organized by IMETU, Tsinghua**

**Nov. 19-21, 2008**

The course is based around the textbook '*RFIC and MMIC Design and Technology*' co-edited by the course leader Dr Stepan Lucyszyn and published by the Institution of Electrical Engineers (IEE), in Nov. 2001.

The course begins by introducing the basic building blocks (passive components and active devices) traditionally employed in advanced RF and microwave integrated circuits. These building blocks are then incorporated into the practical design of integrated circuits. Modern techniques for manufacturing hybrid circuits and multi-chip modules are then explained in detail. Finally, techniques for measuring the scattering parameters of both hybrid and monolithic microwave integrated circuits are explained. Throughout the course, some of the more fundamental tradeoffs associated with the whole design-manufacture measurement process are discussed

### The content and schedule of the courses

Part I 3:00-5:00pm Nov. 20, 2008 IMETU Building Room 302	<ul style="list-style-type: none"> <li>● <b>Passive Components:</b> Lumped-Element Components, Grounding, Distributed Components, Microstrip lines, Power Couplers, Coplanar Circuits, Chip Layout.</li> <li>● <b>Active Device Technologies:</b> GaAs MESFET, Silicon BJT and CMOS, GaAs HEMT, GaAs HBT, SiGe HBT and HFET.</li> </ul>
Part II 微电子所 302 6:30-10:00 pm Nov. 19,2008 Teaching Building 6A311 六号教学楼 6A311	<ul style="list-style-type: none"> <li>● <b>Small-Signal Amplifier Design:</b> Impedance Matching, Gain/Stability, DC Biasing Amplifier Topologies, Distributed Amplifiers, Low Noise Amplifiers, Drivers for Optical Communications</li> <li>● <b>Power Amplifier Design:</b> Power Devices, Theoretical Design, Power Combining, Case Study, Efficiency Control, Linearization, Travelling-Wave Tube Amplifiers.</li> <li>● <b>Computer Aided Design:</b> Schematic Editor, Output Displays, Layout Editor, 2.5-D EM Field Solver, Other Major Features, Simulation Engines, 3-D EM Simulation Tools, System Simulators.</li> </ul>
Part III 8:30-11:30am Nov. 21,2008 IMETU Building Room 302 微电子所 302	<ul style="list-style-type: none"> <li>● <b>Oscillator Design:</b> Active Devices, Phase Noise, VCOs, PLLs, Anti-Jitter Circuit, Applications for 76.5 GHz Radar.</li> <li>● <b>Mixer Design:</b> Diode Mixers, Passive Coupling Structures, Active Coupling Structures, Active Mixers, Resistive FET Mixers, Other Mixers.</li> <li>● <b>Filter Design:</b> Basic Filter Characteristics, Design Methodology, Practical Realization, Chain Function Filters, Active Filters.</li> </ul>

Part IV 2:00-6:00pm Nov. 21, 2008 IMETU Building Room 302 微电子所 302	<ul style="list-style-type: none"> <li>● <b>Hybrid Circuit Manufacturing:</b> Materials, Thin-Film Processing, Thick-Film Screen Printing, Power Loss, Thermal Management.</li> <li>● <b>Multi-Chip Module Manufacturing:</b> System-on-Chip (SoC), Multi-Chip Module(MCM), 3D Packaging, Advanced Materials, Systems Applications &amp; Concepts, Terahertz Multi-Chip Module Technology for the 21st Century.</li> <li>● <b>Hybrid Circuit Measurements:</b> Test Fixture Measurements, Calibration Procedure, Measuring a Multi-Port Network with a 2-Port VNA, Time-Domain Gating.</li> <li>● <b>Monolithic Circuit Measurements:</b> Probe Station Measurements, Pre-Calibration Procedure, Calibration, Verification, Accurate On-Wafer Component Characterisation, Measurement Errors, TOPAS Non-Linear Modelling, Applying DC Bias, MMIC Layout Considerations, Above 110 GHz, Load-Pull Equipment.</li> </ul>
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### ABOUT THE SPEAKER

Stepan Lucyszyn worked for a short time within the French space industry, at Alcatel Espace (Toulouse) as a Digital Systems Research Engineers, working on transmultiplexing algorithms. He then went on to work at systems level within the UK Space industry, at Vega Space Systems Engineering Ltd, on INMARSAT-2 and the UK's Ministry of Defense SKYNET-4 projects. After gaining his PhD from King's College London, investigating ultra-broadband monolithic microwave phase shifters, he stayed on as a Research Fellow to look at novel microwave signal processing techniques. He joined Imperial College London in June 2001, as a Senior Lecturer within the Optical and Semiconductor Devices Group. Prior to this he was a Senior Lecturer at the University of Surrey (UK). He was the architect and coordinator for two large multi-University millimetre-wave research projects; "Millimetre-Wave Signal Processing for Data Communications and Radar Applications" and "75-300 GHz Multi-Chip Module Technology". In addition, he has been a co-investigator on many other research projects at devices, circuit and systems levels. In 1999 he was a *Tan Chin Tuan* Exchange Fellowship in Engineering at Nanyang Technological University (NTU), Singapore. More recently, during the summer of 2002, Dr Lucyszyn worked as a Guest Researcher, within the MEMS laboratory of the National Institute of Advanced Industrial Science and Technology (Tsukuba, Japan). Dr Lucyszyn represents Imperial within the European Union's *Framework VI* Network of Excellence on *Advanced MEMS for RF and Millimeter Wave Communications (AMICOM)*. He has (co-)authored 91 publications in the broad area of microwave and millimetre-wave engineering: 82 research papers; 8 book chapters; and co-edited 1 book. For the past 8 years he has been teaching 'MMIC Measurement Techniques' at the *IEE Vacation Schools on 'Microwave Measurements'*, held at the UK's National Physical Laboratory (NPL). In recent years, he has been invited to teach on short courses to industry in a number of countries in Europe and Asia. He is invited as the guest professor of Tsinghua University since March 2008.

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1. 适合听众: 微电子、通讯、微波、MEMS专业高年级本科生、研究生和相关企业工程技术人员。
2. 因座位限制, 需要提前联系, 请有兴趣者用电子邮件方式回复至下列地址 [houzh03@mails.tsinghua.edu.cn](mailto:houz03@mails.tsinghua.edu.cn)