New Course Descriptions for new postgraduate programs starting from 2008 onwards

School of Electrical Engineering & Telecommunications

ELEC9701 Mixed Signal Microelectronics Design
UOC6 HPW3
The aim of the course is to enable the student to design advanced analogue, digital and mixed signal microelectronic circuits and to enable self-guided continuing learning in the advancing field of microelectronics. Topics covered include: special IC processes, scaling, matching, parasitics, wires, advanced transistor modelling, frequency analysis, cascode OTAs, fully-differential circuits, filters, sigma-delta converters, logic effort, advanced logic families, TSP registers, arithmetic circuits, timing, clock distribution, self-timed systems, mixed analogue-digital design, current research.

ELEC9702 RFIC Design
UOC6 HPW3
The objective of this course is to provide postgraduate students with an advanced understanding of designing RF integrated circuits in state-of-the-art CMOS technology with the ultimate purpose of integrating the entire transceiver on an IC chip. This course will build on existing knowledge from undergraduate courses on RF electronics with presumed knowledge of transmission line theory, Smith Chart and S-parameters. Course will cover the design of fundamental RF building blocks for communication systems which includes: mixers, low noise amplifiers, power amplifiers, oscillators and phase -lock loops. Noise and nonlinearity considerations in these building blocks will be treated in detail. Implications of each RF building block performance on the overall performance of an integrated communication system will be studied.

ELEC9703 Microsystems Design and Technology
UOC6 HPW3
Interdisciplinary overview of MST (MicroElectroMechanical Systems - MEMS). Transducer definition: Sensors and Actuators. Micromachining techniques including silicon bulk micromachining, silicon surface micromachining, stiction problems, bonding processes, LIGA technique, micromachined mould template and electroplating, sealed cavity formation, stereolithography, chemical mechanical polishing for planarisation, electric discharge micromachining, laser micromachining, focused ion beam micromachining. Properties of materials for micromachining. Mechanical transducers. Optical transducers.Thermal transducers. Magnetic transducers. Chemical and biological transducers. Microfluidic devices. Circuit interfaces to transducers. System considerations. Case studies. Technology trends.

ELEC9704 VLSI Technology
UOC6 HPW3
Introduction to silicon VLSI technology. Future trends in VLSI technology. Technology limitations. Basic technology modules include: crystal growth and wafer preparation; mask generation techniques; lithography; diffusion process; ion implantation; oxidation; etching techniques - wet etching and plasma etching; thin film deposition - epitaxial growth, chemical vapor deposition techniques, metallisation; clean room technology; Advanced process integration for CMOS, BiCMOS and Bipolar fabrication; Failure analysis techniques.

ELEC9705 Advanced Semiconductor Design
UOC6 HPW3
Overview of the current status of VLSI chip technology and its limits, including Moore's Laws. The principles of semiconductor band-gap engineering and the use of advanced heterostructure materials such as GaAs and SiGe. Applications of band-gap engineering in devices such as high-electron mobility transistors (HEMTs), resonant tunneling diodes (RTDs) and semiconductor lasers. Future trends using quantum principles, such as quantum wire devices, single electron transistors (SETs) and quantum computers. Semiconductor nanofabrication technologies for advanced devices.

ELEC9711 Advanced Power Electronics
UOC6 HPW3
The topic to be covered in this course will include: resonant converters, converter circuit characteristic and system modeling, device selection and their modeling, thermal design, gate drive design, magnetic core selection and design, dynamic representation of DC-DC converters, control loops design, case studies of converter system designs.

ELEC9712 High Voltage Systems
UOC6 HPW3
High voltage engineering and technology form an important area in power engineering. It deals mainly with electric insulation systems and processes that take place in power system equipment. In-depth knowledge in this area is essential for designers and operators of high voltage equipment and power utility engineers.

ELEC9713 Industrial and Commercial Power Systems
UOC6 HPW3
The aim of the course is to provide practical knowledge on the design and operation of electrical distribution systems in large commercial buildings or industrial sites. Topics covered include: regulatory aspects; switchboards, cabling systems; transformers and switchgear; earthing systems; electrical safety issues including personnel protection and fire protection; protection of electrical systems (including both overcurrent and surge protection) and condition monitoring; lightning protection; electrical lighting systems; communication systems in buildings; emergency systems; energy efficiency and energy management; power quality and effects of voltage and current harmonics; power frequency magnetic fields and their impact in building and industrial sites.

ELEC9714 Electricity Industry Planning and Economics
UOC6 HPW3
The nature of the electricity & gas industries; climate change and the electricity industry; objectives & options for restructuring; insights from electricity pricing theory; wholesale electricity market design; Australia's restructured electricity industry; National Electricity Market design & performance; the role of electricity networks in a restructured electricity industry including market representation, network pricing and network regulation; ancillary services; design & implementation of retail electricity markets; electricity industry regulation.

ELEC9715 Electricity Industry Operation and Control
UOC6 HPW3
Induction to the evolving electricity industry drivers of restructuring, technological developments and environmental concerns, and their impact on power system operation. Conventional approaches and tools for economic dispatch, unit commitment, hydroscheduling, production costing, reliability measures and operations planning in traditional industry structures. Power system operation within restructured electricity industries-wholesale spot electricity markets, bilateral trading, forward markets and full retail competition. Operation of power systems with renewable energy resources.

ELEC9721 Digital Signal Processing & Applications
UOC6 HPW3
Least squares digital filter design and realisation, finite word length effects, random processes, adaptive filters, linear prediction, multi-rate signal processing, time-frequency analysis, sub-band transforms and wavelets. Applications may include: tone detection, noise reduction, pitch estimation, etc.

ELEC9722 Digital Image Processing Systems
UOC6 HPW3
The fundamentals of digital image processing with topics selected from the following: image models and physical imaging systems; visual perception; rendering systems; linear filtering; linear transforms; mathematical morphology; compression; tomographic image reconstruction; inverse problems in imaging; image enhancement; edge detection; feature extraction; and geometric diffusion.

ELEC9723 Speech Processing
UOC6 HPW3
Fundamentals of speech production, speech analysis: pitch and period extraction, formant estimation, voiced - unvoiced decision. Non-linear smoothing. Linear prediction. Inverse filtering. Implementation of speech/speaker recognition systems. Auditory modelling, auditory masking. Audio signal processing. Speech and audio compression. Compression standards. Speech enhancement.

ELEC9724 Audio & Electroacoustics
UOC6 HPW3
The course is aimed at providing fundamental theory behind the processing of audio signals. Such knowledge is essential in understanding the processing of sound signals (speech and music) in both hardware (various audio equipment including microphones and amplifiers) and software (Digital Signal Processing). Topics covered will include: Acoustics, 1-D Digital Processi ng Concepts, Psychoacoustics, Microphones, Amplifiers, Digital Speech & Music systems, and Reverberation.

ELEC9731 Robust and Linear Control Systems
UOC6 HPW3
Rationale for the study of linear methods. Continuous and discrete LTI systems (tf,zpk and ss), discrete-time approximations. Controllability, canonical forms, pole placement (state feedback design). Observability. Lyapunov stability applied to linear systems. Basic robustness (SISO), sensitivity and complementary sensitivity, classical loop shaping, SISO dynamic controller design using polynomial methods. Robustness (MIMO), singular value decomposition, loop shaping analysis and loop shaping (state feedback). Basic least squares theory as basis for LQR and LQE. The optimal linear regulator, discrete and continuous. Kalman filter and predictor (discrete, continuous). Advanced loop shaping, LTR (continuous time). Advanced robustness, disturbance rejection, H-infinity. Decoupled MIMO controller design. Recursive least squares identification.

ELEC9732 Analysis and Design of Nonlinear Controls
UOC6 HPW3
The course is taught in two halves. The first half covers basic nonlinear control, design and analysis. The second half is devoted to robotic applications. The nonlinear control will cover topics drawn from analysis and design. Analysis includes: general state description of nonlinear systems, linearisation techniques, Lyapunov stability, constrained linear systems, constrained optimisation, multimode control. Design includes: actuator saturation, linearisation and gain scheduling, feedforward control, interactions and LQG control, sliding mode control, adaptive control. The above will be developed with illustrative simulation studies and CAD, and both physical modelling and systems identification will be covered. The robotics material will cover topics drawn from: manipulator kinematics and dynamics, velocity propagation and Jacobians, linear and nonlinear control of manipulators.

ELEC9733 Real Time Computing and Control
UOC6 HPW3
Examines the implementation of modern control techniques and associated instrumentation using distributed computers. Practical hardware aspects, including measurement and actuation, data conditioning, acquisition and transmission, microprocessor devices, and other distributed computing components. Commercial realisations ranging from PLCs to full process control computing systems. Software: executive operating systems, concurrency, control algorithms, numerical problems, languages and development tools in the real-time context. Design of the man-machine interface using interactive computer display systems. The role of simulation and other CAD tools. Steps of engineering development from concept to commissioning. The viewpoint of industrial design is maintained throughout.

ELEC9734 Biomedical Instrumentation and Informatics
UOC6 HPW3
Design and development of biomedical instrumentation for clinical measurement and biomedical research. Hardware and software design issues required to produce instruments which satisfy Australian and International standards for safety, performance and quality control. Tutorials and laboratories will be closely integrated so that design and analysis carried in tutorial sessions will be followed by testing and development in the laboratory sessions. A design project and/or case study will also be required as part of this course.

TELE9751 Internet Design and Equipment Architectures
UOC6 HPW3
This course provides detailed knowledge of the design of equipment and protocols used to build communication networks such as the Internet. The course has five parts: 1. Switches: The motivations for switched networks, and the fabrics that provide the core switching function inside switches and routers. This includes time- and space-division switches, and all-optical switches. 2. Algorithms and techniques for implementing other functions of switches and routers, such as packet classification, buffering, and traffic management. 3. Protocols used between switches and routers, such as the Spanning Tree Protocol and bridges, signalling protocols, fast packet switching and tag switching. 4. Other internetworking devices, e.g. caches, load balancers, and layer 4/7 switches. 5. Design of networks in terms of dimensioning links and nodes (equipment) in order to achieve performance objectives. This course provides

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TELE9752 Network Operations & Control
UOC6 HPW3
This course introduces the principles, techniques, and tools used for the management of modern communication networks such as the Internet. The five major functional areas of network management are discussed: configuration management for configuring the hardware and software on network elements, performance management for measuring and controlling network performance, fault management for detecting and responding to fault conditions in the network, security management for securing and controlling access to resources in the network, and accounting management for tracking and logging network usage.

TELE9753 Advanced Wireless Network
UOC6 HPW3
This course provides advanced knowledge of wideband wireless communication techniques to enable the students to design advanced wireless communication systems. It includes the topics of diversity techniques, multiple access and interference management, Wideband CDMA, Wideband OFDM, antenna arrays, multiple-input/multiple-output communications, spatial multiplexing, space-time processing and coding; and multiuser detection, opportunistic communication, multiuser waterfilling.

TELE9754 Coding & Information Theory
UOC6 HPW3
This course provides advanced knowledge of error control coding technique and theories of information transmission mainly at the physical layer. It include the areas of: information theory, channel capacity, Error control coding techniques for wireless mobile channels, Turbo coding, LDPC coding with iterative decoding algorithms, iterative receivers and their application for wireless communications; Space-time coding and MIMO capacity.

TELE9755 Microwave Circuits, Theory & Techniques
UOC6 HPW3
The general flow of the course is Applications, Systems, Components. Applications of microwaves: (terrestrial and satellite communications, radar, remote sensing, wireless). System requirements for elements are to be analysed. Propagation modes (TEM, TE, TM, quasi-TEM), attenuation, dispersion, S-parameters are parts of general fundamentals. Analysis of circuit components and MIC are to be introduced.

TELE9756 Advanced Networking

UOC6 HPW3
This course provides advanced knowledge of telecommunication networks currently being deployed or likely to be deployed in the future. It focus will be on material drawn from the recent research literature with a particular focus in the following three areas: network-to-network interface issues related to quality of service and reliability; cross-layer optimization issues related to network efficiency; and the control and management of mobility in networks.

ELEC9771 Project Report A Extended
UOC6 HPW6
The project is done in a major area, in which it is offered under the supervision of an academic member of staff. Where the work is carried out externally a suitable co-supervisor may be required. Projects can take many forms such as the design and construction of experimental equipment or a theoretical investigation. Work is to be carried out over 2 sessions. At the end of the work a comprehensive project report giving an account of the student s own research must be submitted. Information on the preparation of project reports is contained in the University Calendar.

ELEC9772 Project Report B Extended
UOC6 HPW6
The project is done in a major area, in which it is offered under the supervision of an academic member of staff. Where the work is carried out externally a suitable co-supervisor may be required. Projects can take many forms such as the design and construction of experimental equipment or a theoretical investigation. Work is to be carried out over 2 sessions. At the end of the work a comprehensive project report giving an account of the student s own research must be submitted. Information on the preparation of project reports is contained in the University Calendar.