

Proposed Graduate Course at ANU: *Overview of Wireless Communications*

Title of the course: Overview of Wireless Communications

Course director: Prof. Rodney Kennedy

Formal Description of course: This course exposes students to current research and open problems in Wireless Communications. The course covers basic communication channel theory, providing background in modulation, coding and information theory. This theory is then applied to current leading-edge research topics, including multiuser and multi-access channels, multiple antenna channels and mobile networking (including ad hoc networking). The course concludes with an examination of emerging wireless technologies such as Home-RF and Bluetooth.

Informal Description of course: This course provides a solid background in wireless communication theory. After completing this course students will be capable of developing their own research topics within the telecommunications area.

Curriculum: Proposed course outline is as follows:

1. COMMUNICATION CHANNELS

Channel modelling, basic information theory, diversity, multi-carrier systems

Transmitter design

- coding, modulation, multicarrier

Receiver design

- equalisation, decoding

2. MULTI-USER CHANNELS AND MULTI-ACCESS CHANNELS

Multiuser Detection (MUD), interference, multi-access systems.

Coverage and capacity enhancing techniques, iterative decoding and interference cancellation

3. MULTIPLE ANTENNA CHANNELS

Single user multi-antenna channel, vector channels.

Capacity of multiple-input multipleoutput (MIMO) channels, modelling for MIMO channels.

Space-time coding, from Alamouti past Tarohk and beyond

4. MOBILE NETWORKING

ad hoc networking (MANET), pervasive computing, mobile satellite systems

Medium access control (MAC), Resource requirement control (RRC), Network planning

5. EMERGING TECHNOLOGY

Ultra-Wide Band (UWB), Multi-band OFDM

Broadband wireless access (BWA)

- channel models, system design (including data reception, transmitter design)

Fixed Wireless Access (FWA), Wireless Networking (WLAN)

Personal Area Networks

- Bluetooth, UWB, Home TF, ZigBee

Evolution of Mobile communications

- from 1st Generation to 4th Generation

Standards

- Mobile, WLAN, PAN, MAN, etc..

Presenters: Dr. Leif Hanlen, Dr. Dhammika Jayalath, Dr. Tony Pollock, Dr. Mark Reed (in alphabetical order)

Dates and Locations: Nominally, `start date`, daily, 10am-12pm in lecture room RSISE building, running for two week

Completion date of course: `start date+3weeks`

Notification date of course: `start date+8weeks`

Workload: 20 hours of lectures, 40 hours of assignments reading and preparation for lectures.

Assumed knowledge of course: Basic probability theory (expectation, variance), undergraduate linear algebra (bases, matrix theory)

Prerequisites, entry requirements: Undergraduate engineering degree.

Assessment procedures: 5 assignments – one per topic. No formal examination.

Assignment options for the course: Five assignments to be handed out through the course. A pass will be conditional upon satisfactory completion of the assignments.

Examiners: Prof. Rodney Kennedy and Leif Hanlen

Fees: Nil