



Wits University Graduate School of
Public and Development Management

PADM5074

ICT Technologies

A fundamental course in the degree of
Master of Management
in the field of ICT Policy and Regulation

Course Convenor:

Charley Lewis, Senior Lecturer & Degree Leader, LINK Centre

8 – 13 March 2010

Classroom F

CONTENTS

1 Content overview

This fundamental course gives a non-technical overview of the technologies that comprise the ICT sector, their evolution and the principles and parameters governing their operation. It aims to give policy makers and regulators in the sector a conceptual grasp of the dynamics, trends and developments intrinsic to the ICT technology environment in order to grasp the implications of this for policy formulation and regulation.

The course is presented within an overall framework for the convergence of technologies across the sector. Issues examined include: the infrastructure and architecture of the public switched telephone network; optical networking, transmission, switching and architecture; packet-switched networks, protocols and routing; wireless networks, including fixed-wireless, mobile, GSM, 3G, WiFi; satellite communications technologies, architectures and applications, broadcasting technologies and infrastructure, including radio, TV, digital broadcasting, signal distribution; computer technologies and applications; VoIP, IP and Internet telephony; broadband, next-generation Internet, multi-media and the future; technological convergence and its implications.

2 Session Summary

	Time	Topic	Presenter
Monday 8 March			
1	09:00 – 09:30	Welcome & course overview	Charley Lewis, LINK Centre
2	09:30 – 12:30	A framework for convergence and the architecture of the PSTN	Charley Lewis
3	13:30 – 17:00	Networks & Infrastructures: transmission, switching and architecture; optical networking; packet-switched networks, protocols and routing	Nathaniel Fadiran, Nokia-Siemens
Tuesday 9 March			
4	09:00 – 12:30	The Cybersphere, wireless networks & the future: fixed-wireless, mobile, GSM, 3G, WiFi, WiMax	Pieter Geldenhuys, Vodacom
5	13:30 – 17:00	The Internet, TCP / IP, VoIP and Internet telephony	Charley Lewis
Wednesday 10 March			
6	09:00 – 12:30	Satellite communications technologies, architectures and applications	Andy Louis, Telemedia
7	13:30 – 17:00	Broadcasting technologies and infrastructure: radio, TV, digital broadcasting, signal distribution	Gerhard Petrick, MultiChoice Technical Operations
Thursday 11 March			
8	09:00 – 12:30	Managing ICT applications	Prof Rex van Olst, School of Electrical and Information Engineering
9	13:30 – 17:00	Broadband, undersea cables, next-generation networks, multi-media, and the future	David Vannucci, SEIE

	Time	Topic	Presenter
Friday 12 March			
10	09:00 – 12:30	Technology convergence and its implications	Rex van Olst
11	13:30 – 17:00	Group presentations	Charley Lewis
Saturday 13 March			
12	09:00 – 12:00	Examination	Charley Lewis

3 Course Outcomes

On completion of this course, participants will be able to:

- describe the development of the technologies and infrastructure underpinning the delivery of telecommunications, broadcasting and IT services;
- explain the network architectures of major information and communications platforms;
- discuss the standards used in the Information and communications technologies;
- articulate the technical factors influencing convergence of ICTs;
- assess the implications of ICT technologies for policy and regulation.

4 Core Readings

The following readings are recommended for the course and you are required to familiarise yourself with the content before commencement of the module.

The following readings are available from the library:

- Dodd, S (2002) *The Essential Guide to Telecommunications*, 3rd Edition, Prentice Hall, New Jersey (Management Library - overnight loan, usually shelf no TK 5105 DOD)
- Freeman, R (2001) *Practical Data Communications*, John Wiley, New York (Management Library - overnight loan, usually shelf no TK 5105 FRE)

The following resources are available in electronic format:

- ICT Regulation Toolkit Module 7: New Technologies and their Impacts on Regulation, Executive Summary, prepared by Technical University of Denmark, infoDev & ITU, March 2007, available at <http://icttoolkit.infodev.org/Mod7ExecSummary>
- Ofcom (nd) 'Technology Research Overview', Office of Communications, London, at <http://www.ofcom.org.uk/research/technology/overview/>
- Ofcom (2009) 'Converged Communications in Tomorrow's World: Ofcom's Technology Research Programme 2008/09', Office of Communications, London, available online at <http://www.ofcom.org.uk/research/technology/overview/randd0809/Report0809Final.pdf>

5 Required Readings

One or more readings are **required** to be completed for each session. A number of these are distributed by e-mail, commencing several weeks in advance of the course. They are usually sent out using APA referencing format, and you are required to locate each reading via a search engine (such as Google or Google Scholar) or on the university's database of journals, and download and read each (they will **not** be reprinted for the course pack).

The remaining readings are printed out and included in your course pack.

You are expected to complete ALL readings required for each session IN ADVANCE, as the lecture will assume familiarity with their content.

Lecturers who use teaching aids or provide additional material, will distribute these notes to you as they become available. These notes should be added to your course file and included as part of your course materials..

6 Additional Readings

Additional readings for each session are listed in this course outline. They are intended to provide a starting point (but far from the last word) for exploring each of the topic areas in greater depth and detail.

Should you choose to submit an assignment on one of these topic areas, you should track down and read each of these additional readings as a matter of course - together with several further relevant readings.

An electronic library of course notes and additional reference material relevant to this course is made available via the Wits Ignite web site at <http://ignite.wits.ac.za>. You will be given a logon ID and password to allow you to access this material: a folder named 'PADM 7006 Global Trends Affecting ICT Regulation' contains material relevant to this specific module. You are strongly encouraged to make extensive use of resources and features of this course web site.

You may also be required to contribute to online discussions or to complete assignments and other forms of assessment via this web site.

Note that many of these readings are presented in Acrobat Reader format, which will require you to have Acrobat Reader installed on your computer.

7 Preparation Requirements

Your preparation work – mainly reading - should be done individually before you come on the course. Questions to guide your reading have been provided for this reason. Please note that there may be tasks to prepare for specific sessions. These will assist you to work through the conceptual and theoretical understandings in each of the readings and begin to apply these to cases and issues. Read through each session outline carefully to ensure that there are no mishaps.

We assume that for every 1 hour that you spend in the classroom, 30 in total, you will need to spend approximately 4 additional hours in preparation. This includes reading, writing assignments and examinations.
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8 Syndicates and Group Learning

An interactive and intensive learning methodology is utilised, which involves a combination of lectures, case studies, group and individual projects. Given that many participants are active in shaping the telecommunications sector, the P&DM endorses the “syndicate method” of teaching, which requires that some of the learning will be done in groups. This approach is designed to enable course participants to contribute to the course, bringing in their own practical experience, knowledge and expertise together with those of their peers to create a rich learning environment.

Each participant will be assigned to a syndicate group. Syndicates and group work are a vital component of the learning process and attendance at all syndicate meetings is required and compulsory.

Syndicate meetings will be organised by the group members at a time and place suitable to them in accordance with the programme’s schedule. Although the P&DM will make syndicate meeting rooms available, these meetings need not be held on campus. Syndicate meetings and interactions may also take place virtually, through the course WebCT site and via the mailing lists which will be made available for this purpose.

Problems within syndicate groups are to be reported timeously to the Academic Convenor of this course, so that steps may be taken to resolve them. Syndicates will only be able to change their syndicate group composition under exceptional circumstances, and at the sole discretion of the Academic Convenor.

8 Course Assessment

There are several components to the assessment for this course, viz:

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| • individual online exercises | - | 10% |
| • group assignment | - | 15% |
| • examination | - | 75% |

The individual online exercises may take a variety of formats designed to test your grasp of key concepts and issues.

The group assignment, which is done in syndicate groups during the week, will be distributed on the first day of the course, and is due for completion and presentation on **Friday 12 March**. It comprises a group presentation on a topic related to the course content, and will count **15%** towards your final mark for the course.

The **Examination** will take place on Saturday 13 March 09:00 – 12:00, and will count **75%** towards your final mark for the course.

9 Information on Content Sessions

Session 2: A framework for convergence and the architecture of the PSTN	
Presenter	Charley Lewis, LINK Centre
Outcomes	<p>Participants will be able to:</p> <ul style="list-style-type: none"> • describe the major types of modern telecommunications networks; • discuss the characteristics of evolving Next Generation Networks; • articulate the framework of convergence as an analytical tool in the progression from current to next generation networks; • review existing circuit-switched networks against the backdrop of a convergence framework.
Content	<ul style="list-style-type: none"> • The Public Switched Telecommunications Network (PSTN); the closely related ISDN; 2nd and 2.5G Generation Mobile Networks, the Internet, Enterprise Private Networks, interconnection networks (IP, ATM, Frame relay); and the basic high volume transmission networks • Candidate Next Generation Networks including: broadband Internet, 3G mobile, managed IP telephony networks • Convergence in the progression from current to next generation networks • Conceptual framework for thinking about complex, evolving networks • Layering, domains and planes • Existing circuit switched networks (fixed line PSTN and 2G Mobile) within the framework • Regulatory implications of convergence
Core Readings	<ul style="list-style-type: none"> • Economist (2006) 'Survey: Telecoms Convergence', <i>The Economist</i>, 12 October 2006, available online at http://www.economist.com/surveys/displaystory.cfm?story_id=7995312 <i>[via e-mail]</i> • Gillwald, A (2003) 'National Convergence Policy in a Globalised World: Preparing South Africa for Next Generation Networks, Services and Regulation', LINK Centre Policy Research Paper No 4, University of the Witwatersrand, Johannesburg, available online at http://link.wits.ac.za/papers/ag20030707.pdf <i>[via e-mail]</i> • Hanrahan, H (2004) 'Modelling Convergence: Technology Layering for Horizontal Regulation, Proceedings of Southern African Telecommunications and Applications Conference, 6 - 8 September 2004, available online at http://www.ee.wits.ac.za/comms/Telecomms%20output/output/satnac04/hanrahan.pdf <i>[via e-mail]</i> • Shin, D-H (2006) 'Convergence of telecommunications, media and information technology, and implications for regulation', <i>info</i> Vol 8 No 1, pp. 42-56 <i>[via e-mail]</i> • Singh, R & Raja, S (2009) 'Nothing Endures but Change: Thinking Strategically about ICT Convergence', Chapter 2 in World Bank (2009) <i>2009 Information and Communications for Development: Extending Reach and Increasing Impact</i>, World Bank, Washington. DC, available online at http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICA

	<p>TIONANDTECHNOLOGIES/Resources/282822-1208273252769/Nothing_endures_but_change_policy_responses_to_convergence.pdf <i>[via e-mail]</i></p>
<p>Additional References</p>	<ul style="list-style-type: none"> • Bezzina, J & Sanchez, B (eds) (2005) 'Technological convergence and regulation: Challenges facing developing countries', <i>Communications & Strategies</i>, Special issue, November 2005 • DTI (1999) <i>Regulating communications: approaching convergence in the Information Age</i>, Department of Trade and Industry, London, available online via http://www.dti.gov.uk/converg/ • Frieden, R (2002) 'Adjusting the Horizontal and Vertical in Telecommunications Regulation: A Comparison of the Traditional and a New Layered Approach', <i>Federal Communications Law Journal</i>, Vol 55, 2002-2003, available online at http://www.law.indiana.edu/fclj/pubs/v55/no2/frieden.pdf • ITU (2004) 'Trends In Telecommunication Reform 2004/05: Licensing in an Era of Convergence', International Telecommunication Union, Geneva, executive summary available online at http://www.itu.int/ITU-D/treg/publications/Trends04_summary.pdf • OECD (2007) 'Convergence and Next Generation Networks', Ministerial Background Report DSTI/ICCP/CISP(2007)2/FINAL, OECD Ministerial meeting on the Future of the Internet Economy, Seoul, Korea, 17 – 18 June, 2008, available online at http://www.oecd.org/dataoecd/25/11/40761101.pdf • Whitt, R (2004) 'A Horizontal Leap Forward: Formulating a New Communications Public Policy Framework Based on the Network Layers Model', <i>Federal Communications Law Journal</i>, Vol 56
<p>Activity</p>	
<p>About your Lecturer</p>	<p>Charley Lewis is a senior lecturer, researcher and consultant at the LINK Centre of the School of Public and Development Management at the University of the Witwatersrand. His areas of interest include: labour, work and ICT; ICT sector policy and regulation; universal service and access; the Internet, and business process outsourcing. He has lectured and presented widely, on a number of ICT policy, regulation and development issues. He has undertaken research in a number of areas, including the Internet, call centres, e-learning and universal access and service. He holds the degree of Master of Commerce in the Management of Information Systems from the University of the Witwatersrand.</p> 

Session 3: Networks & Infrastructures: optical networking, transmission, switching & architecture; packet-switched networks, protocols & routing	
Presenter	Nathaniel Fadiran, Nokia-Siemens
Outcomes	<p>Participants will be able to:</p> <ul style="list-style-type: none"> • articulate the key concepts of communications networks; • describe the basic technologies, topologies and principles of operation of LANs, MANs, WANs, WLANs, the Internet and networked applications; • appreciate the policy and regulatory implications of communications networks.
Content	<ul style="list-style-type: none"> • Communications concepts This section covers the basic ideas of networking to bring participants up to speed in the terminology. It deals with communication functions and the OSI model, which is the reference for all discussion of data communications. The following are discussed: connections, media, such as cable and optical fibre, addressing, routing, switching and control. • Local Area Networks (LANs) The ideas of the first section are refined and focused to describe a LAN with its functions, advantages and limitations. The technical difference between a LAN and a WAN is made clear, which is necessary for a sound understanding of network operation and interconnection. This will cover Ethernet and wireless LANs at a conceptual level. • Wide Area Networks (WANs) WANs are discussed in terms of their functions, techniques, such as packet switching, and various technologies, including ATM and MPLS. • The Internet Being of such significance today, and since it links computers and LANs over a series of linked WANs, the Internet will be discussed in some depth. This should consolidate the principles of the previous sections in practice. Participants should gain a good understanding of what the Internet is and how it functions. • Applications In the last section, a number of important data applications, such as client-server and Web Services, are briefly presented. This is followed by voice over networks and VoIP, which is presented in terms of the functions, devices and limitations encountered.
Core Readings	<ul style="list-style-type: none"> • Sportack, M, Pappas, C, Rensing, E, Masters, L, Bligh, M, Starkenburg, M, Cooper, A, Maring, R, Causey, J, Welk, D & Rawles, P (nd) <i>High-Performance Networking Unleashed</i>, Macmillan, Indianapolis, available online at http://docs.rinet.ru/NeHi/ - Chs 1, 2, 4, 5 & 11 <i>[e-mail]</i>
Additional References	<ul style="list-style-type: none"> • Goldman, J (1995) <i>Applied Data Communications: A business oriented approach</i>, Wiley (This book is excellent. It covers the course and provides more depth if required.) • Hekmat, S (2005) <i>Communications Networks</i>, Pragsoft Corporation, Newark, available online at http://www.pragsoft.com/books/CommNetwork.pdf
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**About your
Lecturer**

Nathaniel Fadiran is currently with the systems (Software) engineering group of Nokia Siemens Networks (NSN) as an Integration / Development engineer. Activities revolve around the software lifecycle of IN billing applications. He has had previous experience with research work in wireless access networks.

Nathaniel Obtained his Bachelor of Engineering (Electronics) from the University of Swaziland and his MSc (Electrical Eng) from the University of Cape Town.



Session 4: The Cybersphere, wireless networks & the future: fixed-wireless, mobile, GSM, 3G, WiFi, WiMax	
Presenter	Pieter Geldenhuys, Technology Strategy Consultant (Vodacom)
Outcomes	Participants will be able to: <ul style="list-style-type: none"> • articulate the core principles of operation of the key wireless network technology; • discuss the issues and challenges relating to the regulation of wireless technologies.
Content	<ul style="list-style-type: none"> • Technologies & issues in telecommunication policy & regulation "bellheads" vs "netheads" • Mobile telephony • WiFi & WiMax • General Packet Radio Service • Global System for Mobile Communications • 3G • Universal Mobile Telecommunications System • Broadband wireless
Core Readings	<ul style="list-style-type: none"> • Economist (2007) 'A world of connections', <i>The Economist</i>, 26 April 2007, available online via http://www.economist.com/specialreports/displayStory.cfm?story_id=9032088 [e-mail] • Gilder, G (2000) 'The Twenty Laws of the Telecosm', KurzweilAI.Net, available online at http://www.kurzweilai.net/articles/art0004.html?printable=1 • Goel, L (2005) 'ISRC Technical Briefing: Wireless Communications', C.T. Bauer School of Business, University of Houston, Houston, available online at http://www.uhsrc.com/FTB/Wireless%20Communication/WirelessTechBrief%20Lakshmi_05.doc • IEC (2007) 'Global System for Mobile Communication (GSM)', International Engineering Consortium, Chicago, available online at http://www.iec.org/online/tutorials/gsm/index.asp • Lehr, W & McKnight, L (2002) 'Wireless Internet Access: 3G vs. WiFi?', <i>Telecommunications Policy</i>, Vol 27, Issues 5- 6, June-July 2003, pp 351-370 [e-mail]
Additional References	<ul style="list-style-type: none"> • Ballon, P (2007) 'Changing business models for Europe's mobile telecommunications industry: The impact of alternative wireless technologies', <i>Telematics and Informatics</i>, No 24, pp 192–205 • Bedell, P (2005) <i>Wireless crash course</i>, McGraw-Hill / Osborne, New York (Highly Recommended) • FCC (2003) 'A Short History of Radio: A Short History of Radio, With an Inside Focus on Mobile Radio', Federal Communications Commission, Washington DC, available online at http://www.fcc.gov/omd/history/radio/documents/short_radio.pdf • Goldsmith, A (2005) <i>Wireless communications</i>, Cambridge University Press, Cambridge, UK

	<ul style="list-style-type: none"> • Lindmark, S, Ballon, P, Blackman, B, Bohlin, E, Forge, S & Wehn de Montalvo, U (2006) 'Alternative Wireless Technologies: Trends, Drivers and European Policy Implications', <i>Communications & Strategies</i>, No 62, 2nd quarter 2006, IDATE, Montpellier, last seen at http://www.encip.org/document/eurocpr_2006_publication.pdf • Pelton, J (1995) <i>Wireless and satellite communications: the technology, the market, and the regulations</i>, Prentice Hall, New Jersey • Schwartz, M (2005) <i>Mobile wireless communications</i>, Cambridge University Press, Cambridge, UK
<p>About your Lecturer</p>	<p>Pieter Geldenhuys is a technology strategy consultant in the field of emerging ICT technologies. Pieter is an Electronic Engineer by profession, and has taught Technology Management and Internet strategy at MBA level for the last decade, with periods at UNISA Graduate School of Business Leadership and Potchefstroom University. He has co-authored an academic handbook on E-commerce, and is currently doing research for a new book, called Cybersphere. He likes to live in the future, because that is where he is going to spend the rest his life anyway.</p> 

Session 5: The Internet, TCP / IP, VoIP and Internet telephony	
Presenter	Charley Lewis, LINK Centre
Outcomes	<p>Participants will be able to:</p> <ul style="list-style-type: none"> • describe the infrastructure and functioning of the Internet; • articulate significant past and present trends in the development of the Internet; • articulate the key concepts and protocols of network routing; • explain the principles of routing voice over the Internet; • discuss the technologies and applications of Internet telephony.
Content	<ul style="list-style-type: none"> • The evolution of the Internet • The Internet: infrastructure, architecture & topology • TCP / IP • VoIP, Vol & Internet telephony
Core Readings	<ul style="list-style-type: none"> • Economist (2010) 'A world of connections: A special report on social networking, <i>The Economist</i>, 30 January 2010, available online at http://www.economist.com/surveys/downloadSurveyPDF.cfm?id=15383450&surveyCode=%2555%254b&submit=View+PDF [e-mail] • Leiner, B, Cerf, V, Clark, D, Kahn, R, Kleinrock, L, Lynch, D, Poste, J, Roberts, L & Wolff, S (2009) 'A Brief History of the Internet', <i>ACM SIGCOMM Computer Communication Review</i>, Vol 39, No 5, October 2009 • Shuler, R (2002) 'How Does the Internet Work?', The Shulers, available online at http://www.theshulers.com/whitepapers/internet_whitepaper/index.html • Souter, D (ed) (2009) <i>The APC ICT Policy Handbook</i>, chapters 18 -21, The Association for Progressive Communications, Johannesburg, available online at http://www.apc.org/en/system/files/APCHandbookWeb_EN.pdf [e-mail] • Srivastava, L , Kelly, T, Lu, C and Yu, L (2006) 'digital.life: ITU Internet Report 2006', International Telecommunication Union, Geneva, September 2004
Additional References	<ul style="list-style-type: none"> • Boyd, D & Ellison, N (2007) 'Social Network Sites: Definition, History, and Scholarship', <i>Journal of Computer-Mediated Communication</i>, Volume 13 Issue 1, pp 210 - 230 • Dodd, S (2002) 'The Internet', chapter 8 in Dodd, S (2002) <i>The Essential Guide to Telecommunications</i>, 3rd edition, Prentice Hall, Upper Saddle River, NJ • Goldstuck, A (2010) 'Internet Access in South Africa 2010', World Wide Worx (Pty) Ltd, Johannesburg (electronic copy available via Wits intranet) • Kahn, R & Cerf, V (2004) 'What is the Internet (And What Makes it Work)?', in Cooper, M (ed) (2004) <i>Open Architecture as Communications Policy: Preserving Internet Freedom in The Broadband Era</i>, Center For Internet And Society, Stanford Law School,

	<p>Palo Alto</p> <ul style="list-style-type: none"> • Kapur, A (2005) 'Internet Governance: A Primer', United Nations Development Programme–Asia-Pacific Development Information Programme, Bangkok, available online at http://www.apdip.net/publications/iespprimers/eprimer-igov.pdf • Klein, H (2005) 'ICANN Reform: Establishing the Rule of Law', policy analysis prepared for the World Summit on the Information Society (WSIS), Tunis, 16 -18 November 2005, Georgia Institute of Technology Atlanta, available online at http://www.prism.gatech.edu/~hk28/ICANN_Rule-of-Law.pdf • Mueller, M, Mathiason, J & Klein, H (2007) 'The Internet and Global Governance: Principles and Norms for a New Regime', <i>Global Governance</i>, No 13, pp 237 – 254, available online at http://akgul.bilkent.edu.tr/Governance/ggov.2007.13.2.pdf • OFCOM (2006) 'Regulation of VoIP Services: Statement and further consultation, Office of Communications, London, available online at http://www.telecomweb.com/Assets/readingroom/Ofcom_VoIP_Regulation_Proposal_Feb_2006.pdf • Wilson, E & Wong, K (eds) (2007) <i>Negotiating the Net in Africa: The Politics of Internet Diffusion</i>, Lynne Rienner, Boulder, 2007 • Zittrain, J (2008) <i>The Future of the Internet - And How to Stop It</i>, Yale University Press, New Haven & London, available online at http://futureoftheinternet.org/static/ZittrainTheFutureoftheInternet.pdf
<p>About your Lecturers</p>	<p>See above.</p>

Session 6: Satellite communications technologies, architectures and applications

Presenter	Andy Louis, Telemedia
Outcomes	<p>Participants will be able to:</p> <ul style="list-style-type: none"> • articulate the key principles governing satellite communications; • describe the components and architecture of satellite communications systems; • discuss the policy and regulatory aspects of satellite communications.
Content	<ul style="list-style-type: none"> • Introduction to satellite communications - background theory • Satellite technologies - how and why • Earth stations and space stations • Satellite frequency planning (especially interference) • Calculations (earth station look angles, bitrates / bandwidth) • Satellite Network Architectures: Data (an example) • Satellite applications: VSAT, SNG (examples)
Core Readings	<ul style="list-style-type: none"> • Intelsat (2002) 'A Practical Introductory Guide on Using Satellite Technology for Communications', Intelsat, Ltd, Washington, DC, available online at http://www.scribd.com/doc/26625172/A-Practical-Introductory-Guide-on-Using-Satellite [e-mail] • Integrated Publishing (nd) 'Introduction to Satellite Communications', Integrated Publishing, Spring, Texas, available online at http://www.infodotinc.com/neets/book17/76.htm • Integrated Publishing (nd) 'Satellite Characteristics', Integrated Publishing, Spring, Texas, available online at http://www.tpub.com/neets/book17/76a.htm • Integrated Publishing (nd) 'Summary', Integrated Publishing, Spring, Texas, available online at http://www.tpub.com/neets/book17/76f.htm • Wikipedia: "Communications Satellites": http://en.wikipedia.org/wiki/Satellite_Communications [e-mail]
Additional References	<ul style="list-style-type: none"> • Elbert, B (2004) <i>The Satellite Communication Applications Handbook</i>, Artech House, Boston • FCC (1999) 'Regulating Satellite Networks: Principles and Process', Federal Communications Commission, Washington DC, Chapter 8 in FCC (1999) <i>Connecting The Globe: A Regulator's Guide To Building A Global Information Community</i>, Federal Communications Commission, Washington DC, available online at http://www.fcc.gov/connectglobe/sec8.html • Pelton, J (1995) <i>Wireless and satellite communications: the technology, the market, and the regulations</i>, Prentice Hall, New Jersey • Satellite Communications (General Information): http://www.isr.umd.edu/~michalis/satellite/General2.html • The Tech (nd) 'The Satellite Site', The Tech Museum of Innovation, San Jose, California, http://www.thetech.org/exhibits/online/satellite/ <p>Vendor Web Sites:</p> <ul style="list-style-type: none"> • http://www.intelsat.com • http://www.newskies.com • http://www.gilat.com • http://www.eutelsat.com
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**About your
Lecturer**


Andy is a senior Broadcast Engineer at Telemedia (Pty) Ltd. - a major service provider to the television and broadcasting industries. Andy has over ten years experience in all aspects of the broadcast world, from television and radio studios to satellite transmissions systems. Telemedia has always been at the forefront of advances in technology, and Andy has been able to witness the dramatic changes taking place in the television and broadcasting environment. In recent years Andy has been focussing on the Satellite Operations sector, especially SNG (Satellite News Gathering) and permanent Teleport (Earth Station) installations, maintenance and operation. Andy holds a BSc in Electrical Engineering from UCT.



Session 7: Broadcasting technologies and infrastructure: radio, TV, digital broadcasting, signal distribution	
Presenter	Gerhard Petrick, MultiChoice Technical Operations
Outcomes	<p>Participants will be able to:</p> <ul style="list-style-type: none"> • describe the basic components and systems of a broadcast network, and their functions; • articulate the relative weaknesses and strengths of the various broadcast systems and technologies; • articulate the relevance and importance of radio frequency propagation, spectrum planning and licensing; • outline the features of digital broadcast systems and the respective challenges of introducing digital broadcasting.
Content	<ul style="list-style-type: none"> • The history of broadcasting • Introduction to analogue broadcasting, modulation techniques, propagation, RF spectrum planning • Overview of signal distribution networks • Role of a signal distributor: coverage planning, high-site establishment and management, shared infrastructure • Digital broadcasting systems: features, challenges, frameworks
Core Readings	<ul style="list-style-type: none"> • FCC (2003) 'Radio Pioneers & Core Technologies', Federal Communications Commission, Washington DC, available online at http://www.fcc.gov/omd/history/radio/ • Armstrong, C & Collins, R (2004) <i>Digital Dilemmas for South African TV</i>, Policy Research Paper No 6, LINK Centre, University of the Witwatersrand, Johannesburg, available online at http://link.wits.ac.za/papers/ddtvcarc.pdf
Additional References	<ul style="list-style-type: none"> • Peters, J (1985) 'A History of Television', European Broadcasting Union, Geneva, available online at http://www.ebu.ch/dvb_articles/dvb_tv-history.htm • Digital Broadcasting Migration Working Group (2006) 'The Proposed Switchover from Analogue Broadcasting to Digital Broadcasting in South Africa', report to the Department of Communications by the Digital Broadcasting Migration Working Group, 17 November 2006 • DoC (2007) 'Draft Broadcasting Digital Migration Strategy for South Africa', Department of Communications, Pretoria, available online at http://www.doc.gov.za/digitalm/index2.php?option=com_content&do_pdf=1&id=64 • DoC (2007) 'Broadcasting Digital Migration: Implementation Plan for South Africa', Department of Communications, Pretoria, available online at http://www.doc.gov.za/digitalm/images/stories/Digital_Migration/Misc_Docs/draft%20digital%20migration%20implementation%20plan%20v1.pdf • SADIBA (nd) <i>Recommendations on Terrestrial Digital Radio for South Africa</i>, Southern African Digital Broadcasting Association, Johannesburg, available online at http://www.sadiba.co.za/PDFfiles/dr_recommendation.pdf • SADIBA (nd) <i>Recommendations on a South African standard for Digital Terrestrial Television (DTT), minimum receiver functionality and acceptable quality of service</i>, Southern African Digital Broadcasting

	<p>Association, Johannesburg, available online at http://www.sadiba.co.za/PDFfiles/dtt_standards_recommendation.pdf</p> <ul style="list-style-type: none"> • SADIBA (nd) Recommendations on the management of Service Information (SI) for Digital Terrestrial Television (DTT), Southern African Digital Broadcasting Association, Johannesburg, available online at http://www.sadiba.co.za/PDFfiles/dtt_si_recommendation.pdf • SADIBA (nd) <i>Analogue to digital television broadcast migration strategy for South Africa</i>, Southern African Digital Broadcasting Association, Johannesburg, available online at http://www.sadiba.co.za/PDFfiles/dtt_migration_recommendation.pdf • SADIBA (nd) Interim position on digital broadcasting policy and regulatory issues, Southern African Digital Broadcasting Association, Johannesburg, available online at http://www.sadiba.co.za/PDFfiles/inyerim_position.pdf <p>Web sites:</p> <ul style="list-style-type: none"> • SenTech - http://www.sentech.co.za/ • WorldDAB - http://www.worlddab.org • Digital Video Broadcasting Project - http://www.dvb.org • NTL - http://www.ntl.co.uk
Activity	<p>Take a radio and scan through the band (If possible FM/MW and SW). Record the number of stations you receive, the respective frequency used, as well as your impression of the quality</p>
About your Lecturer	<p>Gerhard has a passion for media, broadcasting and information communication technology and has worked in a variety of engineering fields, most recently in the areas of Radio Frequency Interference, Spectrum Management and Digital Broadcasting. Gerhard has served as Secretary of the Southern African Digital Broadcasting Association and in June 2004 completed his term of office as Councillor with the Independent Communications Authority of South Africa.</p> <p>Gerhard holds a National Higher Diploma in Electrical Engineering from Technikon Witwatersrand, a B.Tech Degree in Business Administration from Technikon South Africa, is registered with the Engineering Council of South Africa as Professional Technologist (Engineering) and is Certified as Senior Broadcast Engineer with the US based Society of Broadcast Engineers.</p>

Session 8: Managing ICT applications

Presenter	Prof Rex van Olst, School of Electrical and Information Engineering	
Outcomes	Participants will be able to: <ul style="list-style-type: none"> • articulate some key indicators, drivers and trends in IT; • describe role of the Chief Information Officer; • present an overview of key IT applications areas; • be familiar with the basics of software development and the software design lifecycle 	
Content	Drivers and trends in ICT applications; the role of the Chief Information Officer CIO; IT applications areas; software development and design	
Core Readings	<ul style="list-style-type: none"> • Bingham, B, Strauss, P & Edwards, M (2003) 'Validating the Business Benefits of Converged Communications', IDC White Paper, IDC, Framingham, MA, June 2003 • Cardin, L, Orlov, L & Belanger, B (2006) 'How CIOs should spend their day', Forrester Research, Cambridge MA, December 2006 • Gartner (2007) 'Creating Enterprise leverage: The 2007 CIO Agenda'; Gartner Group, Stamford, February 2007 • Mark, D & Monnoyer, E (2004) 'Next-generation CIOs', <i>The McKinsey Quarterly</i>, McKinsey & Company, San Francisco, July 2004 • Martin, E, Brown, C, DeHayes, D, Hoffer, J & Perkins, W (2005) <i>Managing Information Technology</i>, 5th Edition, Pearson Education, Upper Saddle River, NJ (Commerce Library, shelf no T 58.6 MAN) • Other references will be handed out at the lecture session 	
Additional References	<ul style="list-style-type: none"> • Davis, F & Venkatesh V (2004) 'Toward Preprototype User Acceptance testing of New Information Systems: Implications for Software Project Management', <i>IEEE Transactions on Engineering Management</i>, February 2004, Institute of Electrical and Electronics Engineers, New York • Forman, G & Zahorjan, J (1994) 'The Challenges of Mobile Computing', <i>Computer</i>, vol 27, no 4, Institute of Electrical and Electronics Engineers Computer Society Press, Los Alamitos, California • Gartner (2004) 'The Mobile Scenario'; Gartner Symposium ITXPO 2004, Cape Town, 2 – 4 August 2004, Gartner Group, Stamford • Satyanarayanan, M (1996) 'Fundamental Challenges in Mobile Computing', ACM Symposium on Principles of Distributed Computing, 1996 	
Activity		
About your Lecturer	Rex van Olst is an Associate Professor in the School of Electrical and Information Engineering at Wits. He holds an MSc (Eng) and a BSc (Elec Eng) from Wits and an MBL from UNISA. Rex is a Fellow of the Computer Society of South Africa and of the SA Institute of Electrical Engineers.	

Session 9: Broadband, undersea cables, next-generation networks, multi-media and the future	
Presenter	David Vannucci, SEIE
Content & Outcomes	<p>Broadband</p> <ul style="list-style-type: none"> • Describe the concept of broadband Internet • Growth of Internet demand in Africa and the world (stats for 2008 and predictions to 2012) • Understand the infrastructure and functioning of the Internet: Undersea Cable • Fixed and wireless broadband technologies (a quick overview) <p>Next Generation Internet and Multimedia</p> <ul style="list-style-type: none"> • Evolution of the Internet and Web applications: static to dynamic to interactive rich web applications • Distributed applications and SOA (service oriented architectures, Web services) • Multimedia systems (Video, VoIP ...) • Peer to Peer file sharing technologies (a quick overview) <p>What the Future Holds</p> <ul style="list-style-type: none"> • Cloud computing, virtualisation
Core Readings	<p>Broadband</p> <ul style="list-style-type: none"> • ArrayComm, (2004) iBurst Broadband Wireless System Overview, ArrayComm, San Jose, California, October 2004, available online at http://www.arraycomm.com/docs/iBurstOverview.pdf <p>This vendor white paper introduces the core concepts of the iBurst broadband wireless solution from ArrayComm. The iBurst solution is being used in South Africa by WBS a new operator that will provide broadband services to key locations. The iBurst system currently allows data rates of up to 1 Mbps. The whitepaper also describes the typical architecture of a wireless access network. One of the most important aspects of the iBurst solution is the use of smart directional antennas. The protocols being used are in a process of standardisation under the 802.20 working group of which ArrayComm is a large shareholder but current implementations are proprietary.</p> <p>This article is important since it is a technology in use in South Africa.</p> <p>Next Generation Networks</p> <ul style="list-style-type: none"> • OECD (2007) 'Convergence and NGN' in OECD (2007) 'Convergence and Next Generation Networks', Ministerial Background Report DSTI/ICCP/CISP(2007)2/FINAL, OECD Ministerial meeting on the Future of the Internet Economy, Seoul, Korea, 17 – 18 June, 2008, available online at http://www.oecd.org/dataoecd/25/11/40761101.pdf <p>What the Future Holds</p> <ul style="list-style-type: none"> • Sridhar, T (2009) 'Cloud Computing: A Primer', The Internet Protocol Journal, Vol 12, No 3, CISCO, San Jose CA, available online at http://www.cisco.com/web/about/ac123/ac147/archived_issues/ipj_12-3/123_cloud1.html <p>Cloud computing is an emerging solution to company computing. This article introduces the various aspects of cloud computing and the underlying infrastructure.</p>
Additional	

References	
Activity	<ul style="list-style-type: none"> • Discuss if the web service architecture is applicable and suitable to broadband wireless in South Africa, and future services that could be offered. • Discuss Mobile Internet and emerging mobile services.
About your Lecturer	<p>David Vannucci is a full time PhD student at Wits University. He is currently researching how to control telecoms calls via Web Services. David is a sessional lecturer for Wits. David is interested in mobile and telecoms services, and is the creator of Mobiraba, a Morabaraba cellphone game, which was awarded second place at the SIMagine 2007 Worldwide Mobile Communication and Java Card Developer Contest at the 3GSM Conference, Barcelona, Spain.</p> 