UNSW AUSTRALIA
Canberra

Course Outline

ZEIT8219 SATELLITE COMMUNICATIONS – S1 2017

Never Stand Still

School of Engineering and Information Technology

Course Staff

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I am usually available for consultation during normal working hours. Please phone or email to make an appointment.

Introduction/Context

Satellite communication systems are now a major part of most telecommunications networks as well as every-day lives through mobile personal communication systems and broadcast television. A fundamental understanding of such systems is therefore important for a wide range of system designers, engineers, and users.

This course is based on a guided study of the prescribed text. The course is focused on the fundamental principles underlying satellite communication systems, treating each with sufficient depth to provide a balanced overview of the constituent system elements. While particular systems are discussed by way of example, the emphasis of the course is on equipping the participant with the sound background knowledge to be able to understand and evaluate such systems.

Student Learning Outcomes

At the successful completion of this course students will, at minimum, be able to:

1. Describe the requirements for the following aspects of a satellite communications system: satellite subsystems, satellite orbits, frequency bands used, antennas and electromagnetic wave propagation for communications between earth stations and satellites.
2. Explain the operation of the following analogue and digital communications techniques: modulation, multiplexing, channel coding and multiple access techniques.
3. Evaluate the advantages and disadvantages of the different types of satellite orbits
4. Perform calculations to determine properties of earth station antennas and satellite footprints.
5. Perform calculations required to conduct a link budget analysis of a satellite system.
6. Conduct a thorough analysis and comparison of two competing satellite systems.

Developing Graduate Attributes

By achieving these learning outcomes you will have worked towards the following Graduate Attributes as specified by Engineers Australia and UNSW:

GA1: The ability to apply knowledge of basic science and engineering fundamentals; (LO 4-6)

GA2: In-depth technical competence in at least one engineering discipline; (LO 5)

GA5: The ability to communicate effectively, not only with engineers but also with the community at large; (LO 1-3)

The Learning Management system used for this course.

Moodle (Modular Object-Oriented Dynamic Learning Environment) is the Learning Management System used at UNSW Canberra. All courses have a Moodle site, which will generally become available to students 1 week from start of semester. Please find all help and documentation (including Blackboard Collaborate) located on the Moodle Support page. Google Chrome 22 or later is recommended browser for optimal compatibility with Moodle. For further details about system requirements click here.

Log in to Moodle here.
If you need further assistance with Moodle:

For enrolment and login issues please contact:
IT Service Centre
Email: itservicecentre@unsw.edu.au
Phone: (02) 9385-1333
International: +61 2 9385 1333

For ALL other Moodle issues please contact:
External TELT Support
Email: externalteltsupport@unsw.edu.au
Phone: (02) 9385-3331
International: +61 2 938 53331
Opening hours:
Monday – Friday 7:30am – 9:30 pm
Saturday & Sunday 8:30 am – 4:30pm

Resources for Students

You will need to obtain the following essential text:

M. Ryan, *Principles of Satellite Communications*, Argos Press, Canberra, 2004.

Course Schedule

Timeline	Topic
Week 1	**1. Introduction to Satellite Communications** Advantages / Disadvantages History of Communications Satellites The Space Environment Basic Satellite Operation and Subsystems
Week 2	**2. Satellite Orbits** Physical Laws and Choice of Parameters Circular Orbits Orbital Perturbations and Height Satellite Ground Traces Satellite launch Orbital Manoeuvring Footprint and Look Angles Solar Eclipses
Week 3	**3. Frequency Bands** Satellite Frequency Bands Interference
Weeks 4–5	**4. Propagation** The Electromagnetic Wave Space-wave Communications Transmission Path Loss Propagation for Mobile Satellite Channels
Week 6	**5. Antennas** The Isotropic Radiator Antenna Properties Antennas for Satellite Communications Pointing Error and Tracking Systems
Week 7	**6. Modulation and Multiplexing** Analogue Modulation Digital Signals Digital Modulation Multiplexing A Comparison of FDM and TDM
Week 8	**7. Channel Coding** The Reason for Coding Basic Elements of Coding Block Codes and Convolutional Codes Interleaving and Concatenated Codes
	Turbo Codes Automatic-Repeat-Request (ARQ) Schemes Coding Gain Comparison of Codes
Week 9	**8. Multiple Access Techniques** FDMA / TDMA / CDMA Frequency Hopping Time Hopping Hybrid Techniques
Weeks 10-11	**9. Link Budget Analysis** Models for Satellite Communications Systems Link Budget Parameters Satellite System Link Equations Link Budget Example Link Budget Analysis Template
Weeks 12-13	**Revision**

Teaching Strategies

You will achieve the major learning outcomes of this course through completion of the online quizzes and assessment. The assignment and exams bring together the basic concepts required to understand modern satellite systems.

Assessment Requirements

There are five assessment items in this course: one assignment and four online tests. The table below gives you the opportunity to work out how to best allocate your time.

Title	Weight	Length	Due date
Test 1 (Chapters 1-3)	10%	1 hr	5:00 pm 10th April
Test 2 (Chapters 4-5)	10%	1 hr	5:00 pm 1st May
Test 3 (Chapters 6-8)	10%	1 hr	5:00 pm 22nd May
Assignment	30%		5:00 pm 13th June
Test 4 (Chapters 1-9)	40%	3 hours	5:00 pm 3rd July

You must achieve at least 50 marks out of a total 100 marks to pass this course. You are not required to pass any one particular piece of assessment; you simply need to pass the course overall.

Online Quizzes

Online quizzes are provided to assist you in confirming your understanding of the body of knowledge covered by the course.

There are nine online quizzes: one for each chapter of the course text.

You may attempt the quizzes as many times as you wish to assist you in your study. No marks are awarded for completion of the quizzes, but you should be aware that the online tests contain similar questions in a similar format, so practice with the quizzes will be useful to you.

Online Tests

The four online tests are to be completed before the due dates specified in the table above. Test questions are drawn from the online quizzes for the relevant chapters (not the questions at the end of each chapter of the text). The test questions will be presented in a similar manner as the quiz questions. Test 1 will cover material from Chapters 1–3 of the course text; Test 2 will cover material from Chapters 4–5 of the course text; Test 3 will cover material from Chapters 6–8 of the course text and Test 4 will cover material from Chapters 1–9 of the course text

You may start the tests at any time before the final due date (although it is recommended that you complete the appropriate quizzes first). You are able to attempt each test only once—your mark will be based on that attempt. Please note, unlike the quizzes, the tests are timed and you must complete as many questions as you can within the set time.

Assignment

The assignment (posted on the online site) provides you with an opportunity to demonstrate your ability to apply the knowledge and understanding you have gained throughout the course. The assignment requires higher order independent thinking beyond the ability to read, comprehend, and remember the information provided in the text book. It will help you draw together all of the discrete areas studied in each chapter.

You are expected to undertake significant effort to complete your assignment (it is worth 30% of the course marks and therefore requires approximately 45 hours of effort). Marks for the assignment will be allocated based on the effort you apply to the assignment and the depth of understanding demonstrated.

Outcomes-Assessment Matrix

Assessment item	**LO 1**	**LO 2**	**LO 3**	**LO 4**	**LO 5**	**LO 6**
Online Tests	x	x	x	x	x	
Assignment			x	x	x	x

Late Submission of Assessment

Non-completion of an online test by the required date will result in a mark of 'zero' being awarded for that test. There will be no extensions granted to the completion date for the tests.

Assignments submitted via Moodle before 5:00pm 13th June 2016 will receive no late penalty. Assignments submitted after that date will receive the following late penalties:

- Submissions received before 5:00pm 20th June, 27th June and 4th of July will receive a 10%, 20% and 30% penalty respectively.
- Submissions received after 5:00pm 4th July will not be marked and a result of 'zero' will be awarded for the assignment.

Please note that lecturer support will NOT be available after the original submission date.

UNSW Moodle supports these web browsers:
Recommend Win 7, Mac OSX 10.7+:
» Internet Explorer 9.0+
» Mozilla Firefox 15+
» Google Chrome 22+
» Safari 6+
** Google Chrome is recommended for optimal compatibility
** Addons and Toolbars can affect the browsers performance.

Academic Honesty and Plagiarism

Plagiarism is using the words or ideas of others and presenting them as your own. Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement.

For more information, please refer to the UNSW Canberra Academic Misconduct website (https://my.unsw.edu.au/student/academiclife/assessment/StudentConductPolicy.html)..

Getting Started Guide

http://sas.unsw.adfa.edu.au/publications/pdf/Getting_Started.pdf

The Getting Started Guide has lots of useful information regarding:

- Where to get help
- Administrative matters
- Getting your passwords set up
- How to log on to Moodle
- Accessing the Library and other areas.