ELEC321

Communication Systems

S2 Day 2014

Dept of Engineering

Contents

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General Information

Unit convenor and teaching staff
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Tutor
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Credit points
3

Prerequisites
ELEC240(P) and (ELEC270(P) or ENGG270(P) or ELEC290(P)) and (MATH232(P) or MATH235(P))

Corequisites

Co-badged status

Unit description
This unit explores: Fourier theory, including frequency-time duality; analogue amplitude and frequency modulation; digital communication systems, including sampling, modulation and demodulation methods, source and line coding, multi-symbol signalling; noise and its effects including noise types and spectrum, information capacity, noise measures, noise performance of digital communication systems, error-control coding and decoding; and communication-system case studies.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity

Ability to apply mathematical methods to the analysis of communication systems

Ability to conduct laboratory experiments using advanced communication systems and equipment

Assessment Tasks

Name	Weighting	Due
Tutorial Questions	5%	Every tutorial
Laboratory Report 2	5%	6 September 2013
Laboratory Report 1	5%	23 Agust 2013
Laboratory Report 3	3%	13 September 2013
Laboratory Report 4	5%	11 October 2013
Laboratory Report 5	5%	25 October 2013
Laboratory Report 6	2%	1 November 2013
Assignment 1	10%	6 September 2013
Assignment 2	10%	1 November 2013
Final Examination	50%	Final Examination

Tutorial Questions

Due: **Every tutorial**
Weighting: **5%**

Written solutions of specific tutorial questions.

On successful completion you will be able to:
- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity
- Ability to apply mathematical methods to the analysis of communication systems

Laboratory Report 2

Due: **6 September 2013**
Weighting: **5%**

Report on Laboratory 2

On successful completion you will be able to:

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity
- Ability to apply mathematical methods to the analysis of communication systems
- Ability to conduct laboratory experiments using advanced communication systems and equipment

Laboratory Report 1

Due: **23 Agust 2013**
Weighting: **5%**

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On successful completion you will be able to:

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity
- Ability to apply mathematical methods to the analysis of communication systems
- Ability to conduct laboratory experiments using advanced communication systems and equipment

Laboratory Report 3

Due: **13 September 2013**
Weighting: **3%**

Report on Laboratory 3

On successful completion you will be able to:

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity
- Ability to apply mathematical methods to the analysis of communication systems
- Ability to conduct laboratory experiments using advanced communication systems and equipment

Laboratory Report 4

Due: **11 October 2013**
Weighting: **5%**

Report on Laboratory 4

On successful completion you will be able to:

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity

- Ability to apply mathematical methods to the analysis of communication systems
- Ability to conduct laboratory experiments using advanced communication systems and equipment

Laboratory Report 5

Due: **25 October 2013**
Weighting: **5%**

Report on Laboratory 5

On successful completion you will be able to:

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity
- Ability to apply mathematical methods to the analysis of communication systems
- Ability to conduct laboratory experiments using advanced communication systems and equipment

Laboratory Report 6

Due: **1 November 2013**
Weighting: **2%**

Report on Laboratory 6

On successful completion you will be able to:

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity
- Ability to apply mathematical methods to the analysis of communication systems
- Ability to conduct laboratory experiments using advanced communication systems and equipment

Assignment 1

Due: **6 September 2013**
Weighting: **10%**

Analogue Communications

On successful completion you will be able to:

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity
- Ability to apply mathematical methods to the analysis of communication systems

Assignment 2

Due: **1 November 2013**
Weighting: **10%**

Digital Communications

On successful completion you will be able to:

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity
- Ability to apply mathematical methods to the analysis of communication systems

Final Examination

Due: **Final Examination**
Weighting: **50%**

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On successful completion you will be able to:

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity
- Ability to apply mathematical methods to the analysis of communication systems
- Ability to conduct laboratory experiments using advanced communication systems and equipment

Delivery and Resources

There are 13 two hour lectures. The lectures will be presented in class and will be available for download using iLearn.

There are 12 tutorial sessions. Each tutorial session has a duration of one hour.

The tutorial problems will be available for download on iLearn. However, the solutions will be presented in Tutorial Class sessions.

The are three hour practical sessions for week 2 to 11. Laboratory notes are available for download on iLearn.

Matlab, TIMS equipment, and laboratory test equipment are used in the practical sessions.

Each student must keep a bound notebook in which experiment details and results are recorded.

The laboratory notebook must be signed by the laboratory demonstrator at the end of the session.

For each practical topic, the student must produce a practical report as described in the laboratory notes which are available on iLearn.

For each visit to an external facility, the student must produce a trip report as described in the

laboratory notes which are available on iLearn.

The subject content and delivery has not changed from previous years.

Unit Schedule

Week 1   Introduction: Signals and Operations

Week 2   Fourier Analysis   Laboratory Session 1

Week 3   Analogue Modulation-AM   Laboratory Session 2

Week 4   Analogue Modulation-FM   Laboratory Session 3

Week 5   Power Spectral Density & Random Processes   Laboratory Session 4

Week 6   Digitisation and Encoding   Laboratory Session 5

Week 7   Baseband Digital Transmission   Laboratory Session 6

Week 8   Digital Modulation Techniques   Laboratory Session 7

Week 9   Noise in Digital Communications   Laboratory Session 8

Week 10   Coding and Error Correction   Laboratory Session 9

Week 11   Multi-User Access;CDMA, OFDM   Laboratory Session 10

Week 12   Satellite Communications

Week 13   Revision

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the Learning and Teaching Category of

Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://informatics.mq.edu.au/help/.

When using the University's IT, you must adhere to the Acceptable Use Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity
- Ability to apply mathematical methods to the analysis of communication systems
- Ability to conduct laboratory experiments using advanced communication systems and equipment

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcomes

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity
- Ability to apply mathematical methods to the analysis of communication systems
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Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity
- Ability to apply mathematical methods to the analysis of communication systems
- Ability to conduct laboratory experiments using advanced communication systems and equipment

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity
- Ability to apply mathematical methods to the analysis of communication systems
- Ability to conduct laboratory experiments using advanced communication systems and equipment

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity
- Ability to apply mathematical methods to the analysis of communication systems
- Ability to conduct laboratory experiments using advanced communication systems and equipment

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity

- Ability to apply mathematical methods to the analysis of communication systems

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity
- Ability to apply mathematical methods to the analysis of communication systems
- Ability to conduct laboratory experiments using advanced communication systems and equipment

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcomes

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity
- Ability to conduct laboratory experiments using advanced communication systems and equipment

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcomes

- Understanding the fundamental concepts in communication systems, including modulation, coding, sampling, noise, and capacity
- Ability to apply mathematical methods to the analysis of communication systems
- Ability to conduct laboratory experiments using advanced communication systems and equipment

Satisfactory completion

Satisfactory completion in all aspects of the unit is required to pass.