



ELEC887

Heterogeneous Networks: Theory and Practice

S1 Day 2018

Dept of Engineering

Contents

<u>General Information</u>	2
<u>Learning Outcomes</u>	2
<u>General Assessment Information</u>	3
<u>Assessment Tasks</u>	4
<u>Delivery and Resources</u>	5
<u>Learning and Teaching Activities</u>	6
<u>Policies and Procedures</u>	6
<u>Graduate Capabilities</u>	8
<u>Changes from Previous Offering</u>	10

Disclaimer

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

General Information

Unit convenor and teaching staff

Unit Convener

Robert Abbas

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Contact via Email

E6B Room 126

Mondays & Thursdays 3-4 PM

Credit points

4

Prerequisites

Admission to MEng and 12cp at 600 level or above

Corequisites

Co-badged status

Unit description

This unit explores the mobile communications-cellular principals and fundamentals for 2G,3G,4G , 4.5G, Air interface model , networks architectures, RAN & EPC, MME, EPS , Network Design and Cell planning , Network Management and operations , cell and network parameters and features, Multilayered and multi RAT, InterRAT Handover between different layers and technologies (Horizontal and vertical Handover) Network Management and operations all from theory and Practices point of view of real-time live networks.

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:

Describe and analyse the mobile communication network cellular concept and architecture,

Demonstrate competency in the 2G,3G,4G LTE fundamentals, Idle Mode and Active Mode.

Able to model, design and simulate different Mobile signal wave forms, Air interface modelling and link budget using LTE MATLAB library.

Working skills in the 2G,3G,4G LTE networks fundamentals, Cell Planning, Design, Operation, Optimisation and Management.

Competency in OSS - Nokia lab eMBB, Multi-layer, Multi band analysis, LTE advanced features, and LTE-LAA

General Assessment Information

Notifications

Formal notification of assessment tasks, grading rubrics and due dates will be posted on iLearn. Although all reasonable measures are taken to ensure the information is accurate, The University reserves the right to make changes without notice. Each student is responsible for checking iLearn for changes and updates.

Report and Assignment Submissions

In Class Test solutions will be posted within a week after the the test date. Submissions will not be accepted once the solution is posted.

All reports and assignments must be submitted electronically through iLearn (in pdf format). Submissions will undergo plagiarism checkers using the turnitin software and any work deemed to have 20% or higher similarity score may incur academic penalty. For more details on the policies of academic penalties relating to academic honesty, please refer to the policies and procedures section below.

Submissions are expected to be typed set in a logical layout and sequence. The expected workload includes preparation of final copies and clear diagrams.

Late submissions

Late submissions will not be accepted without prior arrangement made at least one week before the submission date. Extenuating circumstances will be considered upon lodgement of a formal notice of disruption of studies.

Grading and passing requirement for unit

For further details about grading, please refer below in the policies and procedures section.

In order to pass this unit a student must obtain a mark of 50 or more for the unit (i.e. obtain a passing grade P/ CR/ D/ HD).

Student Responsibilities

Be familiar with University policy, procedures and act in accordance with those policy and procedures.

It is the responsibility of the student to retain a copy of any work submitted. Students must produce these documents upon request. Copies should be retained until the end of the grade appeal period each term.

Student is to perform the required due diligent for their assessment grade and rectify as soon as possible upon finding any errors.

Assessment Tasks

Name	Weighting	Hurdle	Due
Inclasstest1	15%	No	W5
Lab Report 1	25%	No	W7
Inclasstest 2	15%	No	W8
Inclasstest3	15%	No	W12
Lab Report 2	30%	No	W13

Inclasstest1

Due: **W5**

Weighting: **15%**

Inclasstest

On successful completion you will be able to:

- Describe and analyse the mobile communication network cellular concept and architecture,
- Demonstrate competency in the 2G,3G,4G LTE fundamentals, Idle Mode and Active Mode.

Lab Report 1

Due: **W7**

Weighting: **25%**

Lab Report

On successful completion you will be able to:

- Demonstrate competency in the 2G,3G,4G LTE fundamentals, Idle Mode and Active Mode.
- Able to model, design and simulate different Mobile signal wave forms, Air interface modelling and link budget using LTE MATLAB library.
- Competency in OSS - Nokia lab eMBB, Multi-layer, Multi band analysis, LTE advanced features, and LTE-LAA

Inclasstest 2

Due: **W8**

Weighting: **15%**

Inclasstest

On successful completion you will be able to:

- Working skills in the 2G,3G,4G LTE networks fundamentals, Cell Planning, Design, Operation, Optimisation and Management.

Inclasstest3

Due: **W12**

Weighting: **15%**

Inclasstest

On successful completion you will be able to:

- Working skills in the 2G,3G,4G LTE networks fundamentals, Cell Planning, Design, Operation, Optimisation and Management.

Lab Report 2

Due: **W13**

Weighting: **30%**

Lab Report

On successful completion you will be able to:

- Competency in OSS - Nokia lab eMBB, Multi-layer, Multi band analysis, LTE advanced features, and LTE-LAA

Delivery and Resources

The aim of this unit is to enable the students to become job-ready and to have the skills required to satisfy current and future mobile communication industry requirements to manage, analyse and optimize mobile networks.

Lectures will be interactive with students encouraged to participate and engage in discussions through Q&A, industry examples, scenarios, case studies, problem solving, smart mobile applications, Lab and activities, such as, lab modelling and Simulations.

Lab has two parts, Lab modelling and simulation using Mat lab LTE library and Nokia Lab for Network performance and management tools and skills.

Unit will cover fundamentals of mobile networks 2G, 3G, 4G and 4.5G, multi band, multi-access

technology, multi-layer networks. The unit will also provide a comprehensive knowledge and expertise of mobile communication Design, planning, modelling and simulation. Inter working, features, optimisation and management.

Unit will not use theoretical books it will have more lab and practical approach, Student are free to use and book or reference of their choices.

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Learning and Teaching Activities

Nokia LAB

Management tools for mobile networks performance management, optimisation, operation and support of mobile live networks

Matlab LTE Library

Tools for modelling and simulation for mobile networks and systems

Lectures interactive , Brainstorming

Lectures interactive , Brainstorming

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central>). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

Undergraduate students seeking more policy resources can visit the [Student Policy Gateway](https://students.mq.edu.au/support/study/student-policy-gateway) (<https://students.mq.edu.au/support/study/student-policy-gateway>). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/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/study/getting-started/student-conduct>

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit ask.mq.edu.au.

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://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

Learning outcome

- Competency in OSS - Nokia lab eMBB, Multi-layer, Multi band analysis, LTE advanced features, and LTE-LAA

Assessment tasks

- Inclasstest 2
- Inclasstest3
- Lab Report 2

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

Learning outcomes

- Describe and analyse the mobile communication network cellular concept and architecture,
- Demonstrate competency in the 2G,3G,4G LTE fundamentals, Idle Mode and Active Mode.
- Working skills in the 2G,3G,4G LTE networks fundamentals, Cell Planning, Design, Operation, Optimisation and Management.

Assessment tasks

- Inclasstest1
- Inclasstest 2
- Inclasstest3

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience,

of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcomes

- Demonstrate competency in the 2G,3G,4G LTE fundamentals, Idle Mode and Active Mode.
- Able to model, design and simulate different Mobile signal wave forms, Air interface modelling and link budget using LTE MATLAB library.
- Working skills in the 2G,3G,4G LTE networks fundamentals, Cell Planning, Design, Operation, Optimisation and Management.

Assessment tasks

- Lab Report 1
- Inclasstest 2
- Inclasstest3

PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

Learning outcomes

- Able to model, design and simulate different Mobile signal wave forms, Air interface modelling and link budget using LTE MATLAB library.
- Working skills in the 2G,3G,4G LTE networks fundamentals, Cell Planning, Design, Operation, Optimisation and Management.
- Competency in OSS - Nokia lab eMBB, Multi-layer, Multi band analysis, LTE advanced features, and LTE-LAA

Assessment tasks

- Lab Report 1
- Inclasstest 2
- Inclasstest3
- Lab Report 2

PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcome

- Competency in OSS - Nokia lab eMBB, Multi-layer, Multi band analysis, LTE advanced features, and LTE-LAA

Assessment task

- Lab Report 2

PG - Engaged and Responsible, Active and Ethical Citizens

Our postgraduates will be ethically aware and capable of confident transformative action in relation to their professional responsibilities and the wider community. They will have a sense of connectedness with others and country and have a sense of mutual obligation. They will be able to appreciate the impact of their professional roles for social justice and inclusion related to national and global issues

This graduate capability is supported by:

Learning outcome

- Competency in OSS - Nokia lab eMBB, Multi-layer, Multi band analysis, LTE advanced features, and LTE-LAA

Assessment tasks

- Inclasstest3
- Lab Report 2

Changes from Previous Offering

Complete content change