## FIT5011 Network design and performance - Semester 2, 2015

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode of Delivery</td>
<td>1</td>
</tr>
<tr>
<td>Workload Requirements</td>
<td>1</td>
</tr>
<tr>
<td>Academic Overview</td>
<td>3</td>
</tr>
<tr>
<td>Tutors</td>
<td>2</td>
</tr>
<tr>
<td>Chief Examiner</td>
<td>1</td>
</tr>
<tr>
<td>Campus Lecturer</td>
<td>2</td>
</tr>
<tr>
<td>Unit Relationships</td>
<td>1</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>1</td>
</tr>
<tr>
<td>Tutors</td>
<td>2</td>
</tr>
<tr>
<td>Caulfield</td>
<td>2</td>
</tr>
<tr>
<td>Tutors</td>
<td>2</td>
</tr>
<tr>
<td>Caulfield</td>
<td>2</td>
</tr>
<tr>
<td>Your feedback to Us</td>
<td>2</td>
</tr>
<tr>
<td>Previous Student Evaluations of this Unit</td>
<td>2</td>
</tr>
<tr>
<td>Academic Overview</td>
<td>3</td>
</tr>
<tr>
<td>Learning Outcomes</td>
<td>3</td>
</tr>
<tr>
<td>Unit Schedule</td>
<td>4</td>
</tr>
<tr>
<td>Teaching Approach</td>
<td>4</td>
</tr>
<tr>
<td>Assessment Summary</td>
<td>4</td>
</tr>
<tr>
<td>Assessment Requirements</td>
<td>6</td>
</tr>
<tr>
<td>Assessment Policy</td>
<td>6</td>
</tr>
<tr>
<td>Assessment Tasks</td>
<td>6</td>
</tr>
<tr>
<td>Participation</td>
<td>6</td>
</tr>
<tr>
<td>Examinations</td>
<td>7</td>
</tr>
<tr>
<td>Examination 1</td>
<td>7</td>
</tr>
<tr>
<td>Learning resources</td>
<td>8</td>
</tr>
<tr>
<td>Reading list</td>
<td>8</td>
</tr>
<tr>
<td>Feedback to you</td>
<td>8</td>
</tr>
<tr>
<td>Extensions and penalties</td>
<td>8</td>
</tr>
<tr>
<td>Returning assignments</td>
<td>8</td>
</tr>
<tr>
<td>Resubmission of assignments</td>
<td>8</td>
</tr>
<tr>
<td>Assignment submission</td>
<td>8</td>
</tr>
<tr>
<td>Online submission</td>
<td>9</td>
</tr>
<tr>
<td>Technological Requirements</td>
<td>9</td>
</tr>
<tr>
<td>Recommended Resources</td>
<td>9</td>
</tr>
<tr>
<td>Recommended text(s)</td>
<td>9</td>
</tr>
<tr>
<td>Examination material or equipment</td>
<td>9</td>
</tr>
<tr>
<td>Other Information</td>
<td>10</td>
</tr>
<tr>
<td>Policies</td>
<td>10</td>
</tr>
<tr>
<td>Faculty resources and policies</td>
<td>10</td>
</tr>
<tr>
<td>Graduate Attributes Policy</td>
<td>10</td>
</tr>
<tr>
<td>Student Charter</td>
<td>10</td>
</tr>
<tr>
<td>Student services</td>
<td>10</td>
</tr>
<tr>
<td>Monash University Library</td>
<td>10</td>
</tr>
<tr>
<td>Disability Liaison Unit</td>
<td>10</td>
</tr>
</tbody>
</table>
FIT5011 Network design and performance - Semester 2, 2015

This unit will cover network design, performance modelling and analysis. Queuing models (M/M/1, M/M/k, M/M/k/k, M/G/1), networks of queues. Multi-access systems (splitting, reservation, carrier sensing), routing techniques (shortest path, Bellman-Ford, Dijkstra, adaptive routing, flooding). Quality of service (QoS) aspects, flow control, connection admission control and other traffic management functions - ATM, IntServ and DiffServ models. Network topology design and performance modelling, design considerations for local or wide area networks, including GEPON, cable and wireless networks. Introductory probability and graph theory.

Mode of Delivery

Caulfield (Day)

Workload Requirements

Minimum total expected workload equals 12 hours per week comprising:

(a.) Contact hours for on-campus students:

- Two hours of lectures
- One 2-hour tutorial

(b.) Additional requirements (all students):

- A minimum of 8 hours independent study per week for completing lab and project work, private study and revision.

See also Unit timetable information

Additional workload requirements

This unit is mathematically intensive in some areas, and students may need to budget additional study time to revise previous mathematics topics, or do additional reading.

Unit Relationships

Prerequisites

(FIT9135 or FIT5135 or FIT9020) or equivalent
Basic network systems knowledge, understanding of probability theory.

Chief Examiner

Dr Carlo Kopp
Campus Lecturer

Caulfield

Colin Enticott
Consultation hours: By appointment

Chris Freeman
Consultation hours: By appointment

Tutors

Caulfield

Vyacheslav Abramov
Consultation hours: By appointment

Your feedback to Us

Monash is committed to excellence in education and regularly seeks feedback from students, employers and staff. One of the key formal ways students have to provide feedback is through the Student Evaluation of Teaching and Units (SETU) survey. The University’s student evaluation policy requires that every unit is evaluated each year. Students are strongly encouraged to complete the surveys. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied and areas for improvement.

For more information on Monash’s educational strategy, see:

www.monash.edu.au/about/monash-directions/ and on student evaluations, see:
www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html

Previous Student Evaluations of this Unit

This is a new unit being constructed by merging CSE5805 and CSE5808 and updating materials where appropriate.

If you wish to view how previous students rated this unit, please go to
Academic Overview

Learning Outcomes

At the completion of this unit students should be able to:

- explain and construct queuing models for performance modelling of networks;
- explain multi-access systems including splitting, reservation, and carrier sensing;
- explain analysis of routing protocols commonly used on the Internet;
- explain and apply traffic dimensioning for circuit and packet switched networks, including VoIP and multimedia;
- explain and apply design considerations for local or wide area networks, including GEPON, cable and wireless networks;
- explain the analysis and evaluation of the operation of a local or wide area telecommunications network.
### Unit Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Activities</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Please note schedule is subject to change throughout semester, as the unit is still being constructed</td>
<td>No formal assessment or activities are undertaken in week 0</td>
</tr>
<tr>
<td>1</td>
<td>Introduction, Design Considerations in Networks, QoS Parameters</td>
<td>Tutorial</td>
</tr>
<tr>
<td>2</td>
<td>Probability Theory Revision, Correlation</td>
<td>Tutorial</td>
</tr>
<tr>
<td>3</td>
<td>Physical Layer Design: Noise, Modulation, Shannon, Power Budgets</td>
<td>Tutorial; Class Test 1</td>
</tr>
<tr>
<td>4</td>
<td>Physical Layer Design: Copper Cable, Fibre and Radiofrequency Links</td>
<td>Tutorial</td>
</tr>
<tr>
<td>5</td>
<td>Markov Chains and Queues</td>
<td>Tutorial</td>
</tr>
<tr>
<td>6</td>
<td>Circuit vs Packet Switched Systems; Erlang Formulas</td>
<td>Tutorial</td>
</tr>
<tr>
<td>7</td>
<td>Contention Based Multiaccess Systems (Ethernet, ALOHA models)</td>
<td>Tutorial</td>
</tr>
<tr>
<td>8</td>
<td>Traffic Modelling; Self-Similarity and Burstiness Properties</td>
<td>Tutorial</td>
</tr>
<tr>
<td>9</td>
<td>Graph Theory Revision; Application of Graph Theory to Networks</td>
<td>Tutorial</td>
</tr>
<tr>
<td>10</td>
<td>Routing and Route Discovery Algorithms</td>
<td>Tutorial; Class Test 2</td>
</tr>
<tr>
<td>11</td>
<td>Networks of Queues, Multidimensional Queues, Network topology design</td>
<td>Tutorial; Assignment 1 due on Friday, 4PM</td>
</tr>
<tr>
<td>12</td>
<td>QoS Models and Implementations; ATM, IntServ and DiffServ models</td>
<td>Tutorial</td>
</tr>
<tr>
<td>SWOT VAC</td>
<td></td>
<td>No formal assessment is undertaken in SWOT VAC</td>
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</tbody>
</table>

*Unit Schedule details will be maintained and communicated to you via your learning system.

### Teaching Approach

**Lecture and tutorials or problem classes**

This teaching and learning approach helps students to initially encounter information at lectures, discuss and explore the information during tutorials, and practice in a hands-on lab environment.

### Assessment Summary

Examination (3 hours): 50%; In-sememter assessment: 50%

<table>
<thead>
<tr>
<th>Assessment Task</th>
<th>Value</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWOT VAC</td>
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<tr>
<td>Component</td>
<td>Weight</td>
<td>Due Date</td>
</tr>
<tr>
<td>--------------------------</td>
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<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Assignment 1</td>
<td>20%</td>
<td>Week 11</td>
</tr>
<tr>
<td>Class Tests 1 and 2</td>
<td>10% (5% for each test)</td>
<td>Tests held during tutorials in Weeks 3 and 10</td>
</tr>
<tr>
<td>Tutorials</td>
<td>20% (approx 1.8% each tutorial)</td>
<td>End of weekly tutorial class</td>
</tr>
<tr>
<td>Examination 1</td>
<td>50%</td>
<td>To be advised</td>
</tr>
</tbody>
</table>
Assessment Requirements

Assessment Policy

Faculty Policy - Unit Assessment Hurdles

Academic Integrity - Please see resources and tutorials at
http://www.monash.edu/library/skills/resources/tutorials/academic-integrity/

Assessment Tasks

Participation

Attendance in all lectures and tutorials is highly recommended, as the unit is mathematically intensive, and lectures mostly build on previous lecture content.

• Assessment task 1

  Title: Assignment 1
  Description: The assignment will involve capture and analysis of network traffic, and associated report writing. Specific details will be determined during semester.
  Weighting: 20%

Criteria for assessment:
  Student must demonstrate good command of the material and produce correct results. The work must be original - collaborative work is not acceptable. Evidence of plagiarism, copying or other forms of non-examination cheating will result in the work being disallowed.

Due date: Week 11

Remarks:
The assignment will cover this learning outcome:
  ♦ explain and apply traffic dimensioning for circuit and packet switched networks, including VoIP and multimedia;

• Assessment task 2

  Title: Class Tests 1 and 2
  Description: Probability theory test; Graph theory test.
  Weighting: 10% (5% for each test)

Criteria for assessment:
  Student must demonstrate good command of the material and produce correct results. The work must be original - collaborative work is not acceptable. Evidence of plagiarism, copying or other forms of non-examination cheating will result in the work being disallowed.
Assessment Requirements

Due date:
Tests held during tutorials in Weeks 3 and 10

Remarks:
The tests will cover these learning outcomes:

♦ Apply basic probability theory to problems in network performance;
♦ Apply basic graph theory to problems in network routing;

• Assessment task 3

Title:
Tutorials

Description:
Weekly tutorial covering lecture content from preceding week. Students will be required to solve problems.

Tutorials will cover the following learning outcomes:

♦ explain and construct queuing models for performance modelling of networks;
♦ explain multi-access systems including splitting, reservation, and carrier sensing;
♦ explain analysis of routing protocols commonly used on the Internet;
♦ explain and apply traffic dimensioning for circuit and packet switched networks, including VoIP and multimedia;
♦ explain and apply design considerations for local or wide area networks, including GEPON, cable and wireless networks;
♦ explain the analysis and evaluation of the operation of a local or wide area telecommunications network.

Weighting:
20% (approx 1.8% each tutorial)

Criteria for assessment:
Student must demonstrate good command of the material and produce correct results.
The work must be original - collaborative work is not acceptable. Evidence of plagiarism, copying or other forms of non-examination cheating will result in the work being disallowed.

Due date:
End of weekly tutorial class

Examinations

• Examination 1

Weighting:
50%

Length:
3 hours

Type (open/closed book):
Closed book

Electronic devices allowed in the exam:
Non-programmable scientific calculator

Remarks:
The exam will cover the following learning outcomes:

♦ explain and construct queuing models for performance modelling of networks;
Assessment Requirements

♦ explain multi-access systems including splitting, reservation, and carrier sensing;
♦ explain analysis of routing protocols commonly used on the Internet;
♦ explain and apply traffic dimensioning for circuit and packet switched networks, including VoIP and multimedia;
♦ explain and apply design considerations for local or wide area networks, including GEPON, cable and wireless networks;
♦ explain the analysis and evaluation of the operation of a local or wide area telecommunications network.

Learning resources

Reading list

Reading list items for specific lecture topics will be listed in the slides for that topic.

Monash Library Unit Reading List (if applicable to the unit)
http://readinglists.lib.monash.edu/index.html

Feedback to you

Types of feedback you can expect to receive in this unit are:

- Informal feedback on progress in labs/tutes
- Graded assignments with comments
- Test results and feedback

Extensions and penalties

Submission must be made by the due date otherwise penalties will be enforced.

You must negotiate any extensions formally with your campus unit leader via the in-semester special consideration process: http://www.monash.edu.au/exams/special-consideration.html

Returning assignments

Students can expect assignments to be returned within two weeks of the submission date or after receipt, whichever is later.

Resubmission of assignments

Assignment resubmission is not permitted. No penalty late submissions will be offered where illness or other circumstances consistent with university policy may have occurred.

Assignment submission

It is a University requirement (http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-academic-integrity-managing-plagiarism-collusion-procedures.html) for students to submit an assignment coversheet for each assessment item. Faculty Assignment coversheets can be found at http://www.infotech.monash.edu.au/resources/student/forms/. Please check
Assessment Requirements

with your Lecturer on the submission method for your assignment coversheet (e.g. attach a file to the online assignment submission, hand-in a hard copy, or use an electronic submission). Please note that it is your responsibility to retain copies of your assessments.

Online submission

If Electronic Submission has been approved for your unit, please submit your work via the learning system for this unit, which you can access via links in the my.monash portal.

Technological Requirements

Announcements will be made via Moodle; students are permitted but not required to bring notebooks, laptops and tablets into classes.

Recommended Resources


Recommended text(s)


Examination material or equipment

Non programmable scientific calculator.
Other Information

Policies

Monash has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University’s academic standards, and to provide advice on how they might uphold them. You can find Monash’s Education Policies at:

Faculty resources and policies

Important student resources including Faculty policies are located at
http://intranet.monash.edu.au/infotech/resources/students/

Graduate Attributes Policy

http://www.policy.monash.edu/policy-bank/academic/education/management/monash-graduate-attributes-policy.html

Student Charter


Student services

The University provides many different kinds of support services for you. Contact your tutor if you need advice and see the range of services available at http://www.monash.edu.au/students. For Malaysia see http://www.monash.edu.my/Student-services, and for South Africa see http://www.monash.ac.za/current/.

Monash University Library

The Monash University Library provides a range of services, resources and programs that enable you to save time and be more effective in your learning and research. Go to www.lib.monash.edu.au or the library tab in my.monash portal for more information. At Malaysia, visit the Library and Learning Commons at http://www.lib.monash.edu.my/. At South Africa visit http://www.lib.monash.ac.za/.

Disability Liaison Unit

Students who have a disability or medical condition are welcome to contact the Disability Liaison Unit to discuss academic support services. Disability Liaison Officers (DLOs) visit all Victorian campuses on a regular basis.

- Website: http://www.monash.edu/equity-diversity/disability/index.html
- Telephone: 03 9905 5704 to book an appointment with a DLO; or contact the Student Advisor, Student Community Services at 03 55146018 at Malaysia
- Email: dlu@monash.edu
- Drop In: Equity and Diversity Centre, Level 1, Building 55, Clayton Campus, or Student Community Services Department, Level 2, Building 2, Monash University, Malaysia Campus