FIT5083 Network infrastructure - Semester 1, 2015

Transmission media imposes various and often unique constraints on the design of networks and their achievable performance. This unit will cover key performance concepts in copper cables, optical fibre cabled and wireless transmission media. This includes atmospheric propagation impact on QoS, satellite and wireless systems, Wifi, WiMax network propagation issues and planning concepts, and satellite and terrestrial service planning concepts. The infrastructure requirements, reliability and maintainability of networks with specific transmission media will be covered, including the application of GIS in design and planning for terrestrial, mobile and cellular systems.

- IEEE standards: 802.11, 802.16, 802.15
- ITU-T LTE standards

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 laboratory

(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

Unit Relationships

Prerequisites

((FIT9131 or FIT5131 or FIT9017) and (FIT9134 or FIT5134 or FIT9018) and (FIT9132 or FIT5132 or FIT9003 or FIT9019) and (FIT9135 or FIT5135 or FIT9020) and (FIT5136 or FIT4037) and (FIT9130 or FIT5130 or FIT9030)) or equivalent

Chief Examiner

Dr Phu Dung Le
Campus Lecturer

Caulfield

Chris Freeman

Consultation hours: TBA

Tutors

Caulfield

Chris Freeman

Consultation hours: TBA

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

The content in this unit is mostly new, as it was redesigned for the MNS degree. This revised unit has been offered for the first time in 2014.

If you wish to view how previous students rated this unit, please go to https://emuapps.monash.edu.au/unitevaluations/index.jsp
Academic Overview

Learning Outcomes

On successful completion of this unit, students should be able to:

- describe basic communications and network infrastructures;
- analyse and evaluate communications and network infrastructures for enterprises;
- use latest wired and wireless network technologies in building network infrastructures.
## Unit Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Activities</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Lecture content scheduling may be adjusted throughout the semester</td>
<td>No formal assessment or activities are undertaken in week 0</td>
</tr>
<tr>
<td>1</td>
<td>Introduction, Network Infrastructure Concepts; Theory of Transmission (PHY); Shannon Capacity Model; BER; Power Budgets</td>
<td>No Lab</td>
</tr>
<tr>
<td>2</td>
<td>Transmission Media Properties; Loss; Bandwidth vs. Capacity; Dispersion; Group Delay; Distortion; Crosstalk; Interference; Eye Diagrams; Modulations</td>
<td>Lab exercises begin (Week 2 to Week 12)</td>
</tr>
<tr>
<td>3</td>
<td>Wireless Transmission Media Properties; Friis Equation; RF Bands; RF Impairments vs. Bands; Antennas / Gain / Efficiency; Spectral Congestion; Types of wireless channels: WiFi; WiMax; Terrestrial; Satcom</td>
<td></td>
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<tr>
<td>4</td>
<td>Wireless LAN and WiMax Design; Multipath; Propagation Problems in Static Installations; Fading in Mobile Applications; Design Rules for WiFi and WiMax networks; Modulations, Packet Structures and BER Considerations</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Terrestrial Link Design; Fresnel Model; Multipath Effects; Transmission Losses; Interference and Spectral Congestion; Common Modulations, Packet Structures and BER Considerations</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Satellite Link Design; Spatial Diversity; Spectral Diversity; Orbital Geometry: GEO/MEO/LEO; Loss Modelling; Latency Modelling; Two-Ray Model Fading Concepts; Weather Dependencies in Link Design; Common Modulations, Packet Structures and BER Considerations</td>
<td>Assignment 1 due</td>
</tr>
<tr>
<td>7</td>
<td>Copper Cable Transmission Media Properties; Impedance, Bandwidth, Skin Effect; Loss; Dispersion; Types of Cables vs. Transmission Properties; Coax; Twisted Pairs; NEXT/FEXT</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Copper Cable Transmission Media Properties; 802.3, ADSL; VDSL Cable Specs/Standards; Design Considerations; Cable Durability; Installation Considerations</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Optical Fibre Transmission Media Properties; Introduction to Fibre, Numerical Aperture; Sources and Detectors; MM vs. SM; WDM Concepts</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Optical Fibre Transmission Media Properties; Types of Cables vs. Transmission Properties; Design for GEPON Networks</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Networks Reliability and Maintainability; Lusser's Product Law; MTBF/MTTF/MTTR; Durability in Cabled Networks</td>
<td>Assignment 2 due</td>
</tr>
<tr>
<td>12</td>
<td>GIS Applications in Infrastructure Planning</td>
<td></td>
</tr>
</tbody>
</table>
No formal assessment is undertaken in SWOT VAC Examinations period


*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 provides facilitated learning, practical exploration and peer learning.

**Assessment Summary**

Examination (3 hours): 60%; In-semester assessment: 40%

<table>
<thead>
<tr>
<th>Assessment Task</th>
<th>Value</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment 1 (individual assignment)</td>
<td>10%</td>
<td>Week 6</td>
</tr>
<tr>
<td>Assignment 2 (individual assignment)</td>
<td>10%</td>
<td>Week 11</td>
</tr>
<tr>
<td>Lab exercises</td>
<td>20%</td>
<td>End of each weekly laboratory class</td>
</tr>
<tr>
<td>Examination 1</td>
<td>60%</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

• Assessment task 1

  Title: Assignment 1 (individual assignment)
  Description: Individual assignment covering topics from Week 1 - 5.

  Infrastructure Design and Planning Report (format and topic TBD).
  Weighting: 10%
  Criteria for assessment:

  1. Correctness and understanding
  2. Completeness
  3. Presentation quality

  Due date: Week 6

• Assessment task 2

  Title: Assignment 2 (individual assignment)
  Description: Individual assignment covering topics from Week 6 - 11.

  Infrastructure Design and Planning Report (format and topic TBD).
  Weighting: 10%
  Criteria for assessment:

  1. Correctness and understanding
  2. Completeness
  3. Presentation quality

  Due date: Week 11
Assessment Requirements

- **Assessment task 3**

  **Title:** Lab exercises
  **Description:** Lab exercises will be handed out each week from Week 2 to Week 12. Please read the handouts for details.
  **Weighting:** 20%
  **Criteria for assessment:**
  You will get the full mark if you can complete all the exercises and demonstrate them well.
  Different marks will be given depending on the level of completion and demonstration.
  **Due date:** End of each weekly laboratory class

**Examinations**

- **Examination 1**

  **Weighting:** 60%
  **Length:** 3 hours
  **Type (open/closed book):** Closed book
  **Electronic devices allowed in the exam:** Non-programmable scientific calculator is permitted.

**Learning resources**

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
- Solutions to tutes, labs and assignments

**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.

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 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.

Required Resources

Please check with your lecturer before purchasing any Required Resources. Limited copies of prescribed texts are available for you to borrow in the library, and prescribed software is available in student labs.

Matlab software will be used in a number of laboratories, and students should consider installing Matlab on a personal system.

Technological Requirements

Students are permitted to bring privately owned notebooks or laptops into class.

Recommended text(s)


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: www.policy.monash.edu.au/policy-bank/academic/education/index.html

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