ENEE20003 *Optical Fibre Communications*

Term 1 - 2020

Profile information current as at 26/04/2024 06:06 pm

All details in this unit profile for ENEE20003 have been officially approved by CQUniversity and represent a learning partnership between the University and you (our student). The information will not be changed unless absolutely necessary and any change will be clearly indicated by an approved correction included in the profile.

Corrections

Unit Profile Correction added on 17-04-20

The end of term examination has now been changed to a format that could be administered via online means. Please see your Moodle site for details of the assessment.

General Information

Overview

In this unit, you will develop an understanding of optical fibre communications from the basic components up to the system levels. You will analyse various optical fibre link parameters including loss, bandwidth and bit error rate. You will characterise optical components and systems using practical experiments and advanced simulation tools during laboratory/workshop sessions for on-campus students or during a residential school for mixed-mode students. Upon completion of this unit, you will gain advanced knowledge to analyse and design of complex optical communication systems. Prior knowledge of basic concepts of electrical circuit analysis, signals and systems and fundamental electromagnetic theory is assumed. Online students are also required to attend a compulsory residential school.

Details

Career Level: *Postgraduate*
Unit Level: *Level 9*
Credit Points: *12*
Student Contribution Band: *8*
Fraction of Full-Time Student Load: *0.25*

Pre-requisites or Co-requisites

There are no requisites for this unit.
Important note: Students enrolled in a subsequent unit who failed their pre-requisite unit, should drop the subsequent unit before the census date or within 10 working days of Fail grade notification. Students who do not drop the unit in this timeframe cannot later drop the unit without academic and financial liability. See details in the Assessment Policy and Procedure (Higher Education Coursework).

Offerings For Term 1 - 2020

- Melbourne
- Perth
- Rockhampton

Attendance Requirements

All on-campus students are expected to attend scheduled classes – in some units, these classes are identified as a mandatory (pass/fail) component and attendance is compulsory. International students, on a student visa, must maintain a full time study load and meet both attendance and academic progress requirements in each study period (satisfactory attendance for International students is defined as maintaining at least an 80% attendance record).

Residential Schools

This unit has a Compulsory Residential School for distance mode students and the details are:
Click here to see your Residential School Timetable.

Website

This unit has a website, within the Moodle system, which is available two weeks before the start of term. It is important that you visit your Moodle site throughout the term. Please visit Moodle for more information.

Class and Assessment Overview

Recommended Student Time Commitment

Each 12-credit Postgraduate unit at CQUniversity requires an overall time commitment of an average of 25 hours of study per week, making a total of 300 hours for the unit.

Class Timetable

Regional Campuses
Bundaberg, Cairns, Emerald, Gladstone, Mackay, Rockhampton, Townsville

Metropolitan Campuses
Adelaide, Brisbane, Melbourne, Perth, Sydney

Assessment Overview

1. **Online Test**
Weighting: Pass/Fail
2. **Practical Assessment**
Weighting: 20%
3. **Online Test**
Weighting: 10%
4. **Project (applied)**
Weighting: 25%
5. **Examination**
Weighting: 45%

Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the University's Grades and Results Policy for more details of interim results and final grades.

CQUniversity Policies

All University policies are available on the CQUniversity Policy site.
You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the CQUniversity Policy site.

Previous Student Feedback

Feedback, Recommendations and Responses

Every unit is reviewed for enhancement each year. At the most recent review, the following staff and student feedback items were identified and recommendations were made.

Feedback from Unit Survey

Feedback

Reminders of weekly teaching and learning activities in the lectures and Moodle have helped students remain focused on their learning.

Recommendation

Students will continue to be reminded of the teaching and learning activities every week, at the end of lectures and also via news items posted in Moodle when relevant. It is anticipated that the timely reminder of the learning activities will improve performance student outcomes in this unit.

Feedback from Unit Survey

Feedback

One day workshop for learning the simulation software is inadequate for effective use of this software for the design project.

Recommendation

Learning the simulation software will be introduced much earlier in the term in the form of weekly homework for students to familiarise themselves with the operation and the working of the simulation software within the first half of the term and a formal workshop focusing on the design project will be further provided in week 7 as it has always been offered in the previous terms. With these additional scaffolding of learning, it is believed that the students' ability to use the software for simulation of complex systems would be improved. This will then have a flowing effect to improve the quality of the project work and the unit pass rate.

Feedback from Unit Survey

Feedback

The teaching style and the quality of lecture materials and the effective method of delivery had helped me to learn the subject in an easy way.

Recommendation

The teaching materials and the delivery method will be maintained and continuously revised for improvements. Especially more scaffolding of learning steps will be introduced to further ease the learning of difficult concepts to better equip students with the necessary knowledge to tackle the assessment tasks.

Feedback from Unit coordinator's observation

Feedback

The laboratory exercises were very useful to help students learn the key concepts introduced in the lecture.

Recommendation

The laboratory exercises are an integral part of the learning activities for this unit. They also provide students with the practical experiences of optical components and systems. The laboratory exercises will be maintained and continue to be improved with updated materials. A more detailed guidance for the lab report will also be provided to assist students to achieve a better report mark and thus improve their experiences and satisfaction with this assessment.

Feedback from Unit coordinator's observation

Feedback

The online tests assist students to stay focused on recent learned materials and also provide prompt feedback to students about their understanding.

Recommendation

The online tests will be maintained and updated to encourage students to review the materials regularly and also provide them a means for obtaining prompt feedback. This early feedback will provide students with indications of their understanding of the materials which then allow them to act on a timely manner and to improve their unit outcome.

Unit Learning Outcomes

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

1. Analyse optical components including advanced models of optical transmitter, receiver and optical fibre
2. Predict system performances through advanced modelling of loss, bandwidth and error rate using the state of the art simulation tools
3. Design sophisticated fibre optic systems using advanced technologies
4. Characterise components of optical fibre communications systems and confirm overall system performances using both theoretical analysis and practical measurements
5. Document and communicate professional engineering information, including computer-based simulations and drawings using appropriate electrical engineering standards, terminology and symbols
6. Scope, plan, manage and successfully complete engineering projects autonomously and in teams with responsible, ethical and professional attitude regarding the role of engineers.

We are seeking accreditation for the Masters of Engineering Program. This will be a unit in that course.

Alignment of Learning Outcomes, Assessment and Graduate Attributes

— N/A Level · Introductory Level · Intermediate Level · Graduate Level · Professional Level · Advanced Level

Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes					
	1	2	3	4	5	6
1 - Practical Assessment - 20%	•			•	•	•
2 - Online Test - 10%	•					
3 - Project (applied) - 25%		•	•		•	•
4 - Examination - 45%				•		

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes					
	1	2	3	4	5	6
1 - Knowledge	◦	◦	◦	◦		
2 - Communication					◦	◦
3 - Cognitive, technical and creative skills	◦	◦	◦	◦	◦	
4 - Research			◦			
5 - Self-management						◦
6 - Ethical and Professional Responsibility						◦

Graduate Attributes	Learning Outcomes					
	1	2	3	4	5	6
7 - Leadership						∘
8 - Aboriginal and Torres Strait Islander Cultures						

Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes							
	1	2	3	4	5	6	7	8
1 - Online Test - 0%	∘		∘					
2 - Practical Assessment - 20%	∘	∘	∘			∘	∘	
3 - Online Test - 10%	∘	∘				∘		
4 - Project (applied) - 25%	∘		∘	∘	∘	∘		
5 - Examination - 45%	∘		∘					

Textbooks and Resources

Textbooks

ENEE20003

Prescribed

Optical Fiber Communications: Principles and Practice
3rd edition (2008)
Authors: John Senior
Pearson
Edinburgh Gate , Harlow , England
ISBN: 978-0-130-32681-2
Binding: eBook
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Supplementary

FIBER OPTIC COMMUNICATIONS
5th edition (2005)
Authors: Josepth C. Palais
Pearson
Upper Saddle River , New Jersey , USA
ISBN: 978-0-130-08510-8
Binding: Hardcover

Additional Textbook Information
The supplementary book is recommended for learning of this unit as it provides complimentary information to support learning of lecture materials.

View textbooks at the CQUniversity Bookshop

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- Microsoft Office 2010 or 2013 (Word, Excel and PowerPoint)
- Zoom app on your smart phone or access to Zoom on your laptop
- VPI Photonic design suite
- Pdf creator/scanner

Referencing Style

All submissions for this unit must use the referencing style: Harvard (author-date)
For further information, see the Assessment Tasks.

Teaching Contacts

Lam Bui Unit Coordinator
l.bui@cqu.edu.au

Schedule

Week 1 - 09 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic

Teaching Arrangements & Introduction to Optical Fibre Communications	Textbook's Chapter 1	

Week 2 - 16 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Literature Review of a Photonic Topic	None	Forming laboratory and project groups

Week 3 - 23 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to Optical Fibre	Textbook's Chapter 2 and Chapter 3	**Pretest** Due: Week 3 Friday (27 Mar 2020) 11:00 pm AEST

Week 4 - 30 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Optical sources - Lasers	Textbook's Chapter 6 and Chapter 7	

Week 5 - 06 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Optical receivers - Photodetectors	Textbook's Chapter 8 and Chapter 9	

Vacation Week - 13 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Non teaching week	None	

Week 6 - 20 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to VPI Photonics Design Suite	None	

Week 7 - 27 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Optical Amplifier	Textbook's Chapter 10	Laboratory intensive activities **Online Test** Due: Week 7 Monday (27 Apr 2020) 11:59 pm AEST

Week 8 - 04 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Optical Modulation	Textbook's Chapters 12 and 13	

Week 9 - 11 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to Passive Optical Devices	Textbook's Chapters 5 and 11	**Laboratory report** Due: Week 9 Friday (15 May 2020) 11:59 pm AEST

Week 10 - 18 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Wavelength Division Multiplexing (WDM)	Textbook's Chapter 12	

Week 11 - 25 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Link Design - System Rise Time and Bandwidth	Textbook's Chapter 12	**Optical System Project** Due: Week 11 Monday (25 May 2020) 11:59 pm AEST

Week 12 - 01 Jun 2020

Module/Topic	Chapter	Events and Submissions/Topic
Probability of Errors and Bit Error Rate (BER)	Textbook's Chapter 12	

Review/Exam Week - 08 Jun 2020		
Module/Topic	**Chapter**	**Events and Submissions/Topic**
No teaching	All chapters	None

Exam Week - 15 Jun 2020		
Module/Topic	**Chapter**	**Events and Submissions/Topic**
Invigilated final examination	Not applicable	None

Term Specific Information

For non-Melbourne students, intensive teaching and learning activities for this unit are arranged around the middle of term (usually in Week 7) in which students conduct the laboratory and attend the VPI workshop. Attendance of these activities is compulsory as it is necessary and crucial for understanding the laboratory's and the project's requirements. If students could not attend any of these activities, he or she must make an alternative arrangement with the Unit Coordinator by the end of Week 3 of term.

Assessment Tasks

1 Pretest

Assessment Type
Online Test

Task Description
The pretest aims to assess student prerequisite knowledge necessary for learning and thus having a good chance to pass this unit. This test therefore provides a means to gauge student levels to provide some awareness of the student shortcomings for better learning support. The test is multiple choice in format and aims to test basic knowledge of signals and systems, communications engineering and some mathematics foundations. Students who fail to do the pretest will fail the unit.

Assessment Due Date
Week 3 Friday (27 Mar 2020) 11:00 pm AEST
Invigilated online test

Return Date to Students
Week 4 Friday (3 Apr 2020)
Test results will be available to students a week after the test completion

Weighting
Pass/Fail

Assessment Criteria
This test aims to assess students' prior knowledge that is necessary for learning of the unit. The basic electrical engineering concepts will be tested. The test result will provide students with feedback on areas that they may need further support or self-learning to ensure that they have a better chance to pass the unit.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Test will be administered online in an invigilated environment

Graduate Attributes

- Knowledge
- Cognitive, technical and creative skills

2 Laboratory report

Assessment Type
Practical Assessment

Task Description
The laboratory exercises aim to provide students with hand-on experience with optical fibre components and systems. The laboratory consists of several sessions and will be carried out during Week 7 of term. Students will work in group to perform several experiments, observe and record results and write up a report to discuss their findings. Although only one report is required, each student must clearly nominate a specific part of the report that they are responsible for. Collaborations among the students are therefore encouraged to ensure mutual learning and the best possible mark for the group. Students who do not contribute to the laboratory report by providing their parts will receive zero mark.

Assessment Due Date
Week 9 Friday (15 May 2020) 11:59 pm AEST
Only one report in pdf format is submitted per group. The report submission must accompany by the team contribution/responsibility matrix

Return Date to Students
Week 11 Friday (29 May 2020)
Marked reports usually return to students within two weeks after the submission deadline

Weighting
20%

Minimum mark or grade
40%

Assessment Criteria
The detailed marking criteria will be provided in the laboratory document. The assessment criteria focus on the technical details and the demonstration of understanding and application of knowledge. However, there is a few marks allocated for presentation and technical writing. Only one report must be submitted per group. No mark will be given for a report without the accompanied team responsibility matrix. IMPORTANCE: Please be reminded that the lab report has a minimum required pass grade of 40% which means if you achieve less than this minimum grade, you (often the entire group) will immediately fail the unit.

Referencing Style

- Harvard (author-date)

Submission
Online Group

Submission Instructions
Only one report in pdf format is submitted per group. The submitted report must accompany by a team contribution/responsibility matrix that clearly outlines the individual team member's contribution

Learning Outcomes Assessed

- Analyse optical components including advanced models of optical transmitter, receiver and optical fibre
- Characterise components of optical fibre communications systems and confirm overall system performances using both theoretical analysis and practical measurements
- Document and communicate professional engineering information, including computer-based simulations and drawings using appropriate electrical engineering standards, terminology and symbols
- Scope, plan, manage and successfully complete engineering projects autonomously and in teams with responsible, ethical and professional attitude regarding the role of engineers.

Graduate Attributes

- Knowledge
- Communication
- Cognitive, technical and creative skills
- Ethical and Professional Responsibility
- Leadership

3 Online Test

Assessment Type
Online Test

Task Description
Online test is designed to assess student understanding and application of the materials covered between Week 1 and Week 5. This test comprises of multiple choice questions and will be timed. Some of the questions require students to perform a design and calculations to arrive at the correct answer. Please ensure that you read the instructions accompanied the test carefully and understand them clearly prior commencing the test. The test automatically ends

when the test time elapses and therefore it is advisable that you move promptly to the next question when getting stuck. PLEASE NOTE that you have only ONE chance to complete the test and therefore only start the test when you are fully ready i.e. after you have fully reviewed the necessary materials.

Assessment Due Date
Week 7 Monday (27 Apr 2020) 11:59 pm AEST
The test will be opened on Friday of Week 5 and closed on Monday of Week 7. The test MUST be completed within this period of time since after closing the test cannot be reopened

Return Date to Students
Week 8 Monday (4 May 2020)
Test results will be available to students one week after the test closing

Weighting
10%

Assessment Criteria
Online test aims to assess student understanding and applications of the materials covered between Week 1 and Week 5 inclusively. In particular, the test will include questions relating to the following topics:

- Introduction to optical fibre communication
- Scientific literature review
- Optical fibre
- Optical sources: Lasers and LEDs
- Optical receivers: PIN and Avalanche photodetectors

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
It is important that online test MUST be completed within the period of Friday of Week 7 to Friday of Week 8 as after the test closes, it cannot be reopened

Learning Outcomes Assessed

- Analyse optical components including advanced models of optical transmitter, receiver and optical fibre

Graduate Attributes

- Knowledge
- Communication
- Ethical and Professional Responsibility

4 Optical System Project

Assessment Type
Project (applied)

Task Description
This task requires students to work in a group and using VPI Photonics Design Suite to simulate a sophisticated optical system and also preparing a report to communicate their finding. The project consists of two components. The first component is the group work where students work together to complete a system design. The second component is individual work where each student studies a distinct, predefined aspect of the system. Students must work together to produce a single coherent report since only one group report is required for submission. The project marking will be carried out in two parts. The marking for the first part - the group work will be the same by the group members while the marking for the second part will be the individual student work and thus it often varies from student to student. To achieve the best possible mark, students must do well in both parts of the reports. It is essential that the team responsibility matrix is submitted together with the report and states clearly the individual student contributions. This project has a minimum pass mark of 45 out of 100. Students must achieve this minimum mark in the project to pass the unit.

Assessment Due Date
Week 11 Monday (25 May 2020) 11:59 pm AEST
Only one report in pdf format is submitted per group. The report submission must accompany by the team contribution/responsibility matrix and submitted online before the deadline.

Return Date to Students
Review/Exam Week Monday (8 June 2020)
Marked reports are returned to students approximately two weeks after the submission deadline

Weighting
25%

Minimum mark or grade
45%

Assessment Criteria
Detailed marking criteria is provided in the project description document. Students shall investigate a sophisticated optical system using VPI Photonics Design Suite and prepare a report of their findings. Only one report is required per group. The assessment criteria will focus on technical details and demonstration of understanding and applications of knowledge. There is a few marks reserved for technical writing and report presentation. To encourage equal contribution to the project, a team responsibility matrix must be submitted together with the report. Students who do not contribute to the project work by providing their parts will receive zero mark for this report. IMPORTANCE: Please be reminded that the project has a minimum required pass mark of 45% which means if students achieve less than this minimum mark, they will immediately fail the unit.

Referencing Style

- Harvard (author-date)

Submission
Online Group

Submission Instructions
Only one report in pdf format is submitted per group. The report submission must accompany by the team contribution/responsibility matrix and submitted online before the deadline.

Learning Outcomes Assessed

- Predict system performances through advanced modelling of loss, bandwidth and error rate using the state of the art simulation tools
- Design sophisticated fibre optic systems using advanced technologies
- Document and communicate professional engineering information, including computer-based simulations and drawings using appropriate electrical engineering standards, terminology and symbols
- Scope, plan, manage and successfully complete engineering projects autonomously and in teams with responsible, ethical and professional attitude regarding the role of engineers.

Graduate Attributes

- Knowledge
- Cognitive, technical and creative skills
- Research
- Self-management
- Ethical and Professional Responsibility

Examination

Outline
Complete an invigilated examination.

Date
During the examination period at a CQUniversity examination centre.

Weighting
45%

Length
90 minutes

Minimum mark or grade
50%

Exam Conditions
Open Book.

Materials
Dictionary - non-electronic, concise, direct translation only (dictionary must not contain any notes or comments).
Calculator - all non-communicable calculators, including scientific, programmable and graphics calculators are authorised

Academic Integrity Statement

As a CQUniversity student you are expected to act honestly in all aspects of your academic work.

Any assessable work undertaken or submitted for review or assessment must be your own work. Assessable work is any type of work you do to meet the assessment requirements in the unit, including draft work submitted for review and feedback and final work to be assessed.

When you use the ideas, words or data of others in your assessment, you must thoroughly and clearly acknowledge the source of this information by using the correct referencing style for your unit. Using others' work without proper acknowledgement may be considered a form of intellectual dishonesty.

Participating honestly, respectfully, responsibly, and fairly in your university study ensures the CQUniversity qualification you earn will be valued as a true indication of your individual academic achievement and will continue to receive the respect and recognition it deserves.

As a student, you are responsible for reading and following CQUniversity's policies, including the **Student Academic Integrity Policy and Procedure**. This policy sets out CQUniversity's expectations of you to act with integrity, examples of academic integrity breaches to avoid, the processes used to address alleged breaches of academic integrity, and potential penalties.

What is a breach of academic integrity?
A breach of academic integrity includes but is not limited to plagiarism, self-plagiarism, collusion, cheating, contract cheating, and academic misconduct. The Student Academic Integrity Policy and Procedure defines what these terms mean and gives examples.

Why is academic integrity important?
A breach of academic integrity may result in one or more penalties, including suspension or even expulsion from the University. It can also have negative implications for student visas and future enrolment at CQUniversity or elsewhere. Students who engage in contract cheating also risk being blackmailed by contract cheating services.

Where can I get assistance?
For academic advice and guidance, the Academic Learning Centre (ALC) can support you in becoming confident in completing assessments with integrity and of high standard.

What can you do to act with integrity?

Be Honest
If your assessment task is done by someone else, it would be dishonest of you to claim it as your own

Seek Help
If you are not sure about how to cite or reference in essays, reports etc, then seek help from your lecturer, the library or the Academic Learning Centre (ALC)

Produce Original Work
Originality comes from your ability to read widely, think critically, and apply your gained knowledge to address a question or problem