

# ECG - 614 - Quantum Communication

2 Graduate Course Create 2022-23

## I. Course Information

The faculty member originating this proposal is to complete sections I,II, III and IV.

Before starting this form, please review graduate curriculum website on policies and processes: <https://www.unlv.edu/graduatecollege/curriculum>

FILL IN ALL FIELDS. You will not be able to launch/submit the proposal without completing the required fields.

Department:\*

Electrical and Computer Engineering

Prefix:\*

ECG

Number:\* 614

Is the creation of a new Prefix being requested?\*

Yes

No

Suggested New Prefix:

Long Course Name:\* Quantum Communication

Short Course Name (25 characters, can be abbreviated):\* Quantum Communication

Explanation for Course Creation:\*

This course lays the fundamental background of quantum communication. It covers quantum optics, quantum entanglement. quantum correlation, quantum information, quantum amplification, etc.

Differential fees required for this course?\*

Yes

No

If yes, please explain:

## Creating the Catalog Description:

avoid the use of the words *student*, *course*, and *covers*.

incomplete sentences are ok.

avoid repeating the course title.

use of an active voice, e.g. explores, investigates,...

50 words max.

### Catalog Description 50 words limit (read guidelines above):\*

Review of communication systems and quantum mechanics. Quantum harmonic oscillators. Field quantization. Single-mode, two-mode, and multi-mode quantum optics. Quantum Entanglement. Quantum correlation. Quantum information. Quantum amplification. Semiclassical and quantum photodetection. Fiber optics and free-space communication channels. Quantum key distribution. Crosslisted with EE 414.

Is this course a  
culminating  
experience?\*

Yes

No

If Yes, to which  
programs?

First term and year  
you intend to offer  
this course:\*

Fall 2022

## Service-Learning designation

Information about Service-Learning is available [here](#). Faculty can visit the [faculty Service-Learning page](#) as well as the [UNLV Guide for Service Learning](#) for additional information.

Are you adding a  
Service-Learning  
designation to this  
course?\*

Yes

No

## II. Catalog Information

Will this be an  
experimental (x)  
course?\*

Yes

No

Has this course  
number been used  
previously as an  
Experimental (X)  
course?

Yes

No

If Yes, X Course

If yes, X-Course  
Prefix:

X-Course Number:

### X-Course maximum offering

X Courses can only be offered a maximum of two times and within a two year limit after approval.

How many times will  
this x-course be  
offered?  1  
 2

### Program Changes Needed?

If program changes are needed as a result of this course creation, a **separate program change proposal must be submitted.**

Please describe below your plan for program changes related to this proposal.

QUESTIONS? contact [gradcurriculum@unlv.edu](mailto:gradcurriculum@unlv.edu)

**Program(s) impacted by this new course:\*** This course will be listed under the area of Solid State Electronics and Photonics.

**Detail the changes to the program catalog entry required due to the creation of this course:\*** In the area of Solid State Electronics and Photonics, add this course in Approved Major Field Courses.

### CROSS-LISTING OR COMBINING COURSES

300- or 400-level courses may be cross-listed with 500-level courses; 400-level courses may also be cross-listed to 600-level courses. Courses that are at the 700 level and above may not be cross-listed with undergraduate courses.

**Select one of the options:\***  Same As = e.g. Undergraduate: same content and same career (UG/UG). Graduate: Same/similar course content and same career (Grad/Grad)  
 Cross-listing = Cross-listed courses contain the same or similar content and may be in different programs (e.g. WMST 621 & SOC 621) or different careers (e.g. BIOL 467 & BIOL 667 or PSC 722 & PHIL 728)  
 Not Cross-Listed or Same As

**List cross-listing courses (or type "none"):** EE414 Quantum Communication

## CROSS-LISTING RATIONALE

Please answer the following questions in the "rationale" field below:

What aspect of graduate preparation is met via this course that goes beyond the undergraduate program?

What common aspects are offered in the cross-listings and what grad level pieces are not?

What would be beneficial in offering the cross-listed courses from a graduate education perspective?

**Cross-listing  
Rationale:**

1. This course covers advanced materials reflected in homework questions and projects for graduate students who can take this course to fulfill degree-required credits in the area of Solid State Electronics and Photonics.
2. Graduate students have additional assignments.

## Credits

**Fixed/Variable  
Credits:\***  Fixed  Variable

If fixed, enter number of credits. If variable, enter minimum and maximum credits (E.g., 1-3).

**Number of Credits:** 3

## Course Repeatability

**Can students repeat  
this course?\***  Yes  No

**If yes, insert  
maximum credits  
students can earn  
(blank=unlimited):**

## Grading

**Grading System\***  Letter Grade  
 S/U  
 S/F (will count towards GPA)  
 S/X/F for Thesis/Dissertation

**The passing grade for  
courses is assumed  
as B- unless stated  
otherwise. Please  
indicate a different  
passing grade for this**

course if applicable:

## Special Topics Courses

Is this a Special Topics course?  Yes  No

List the topic(s):

Are topics repeatable?  Yes  No

If yes, list the credit limit for each topic:

## Requisites (if any)

Graduate standing is the default prerequisite for all graduate-level courses.

Prerequisites:

Corequisites - course(s) that must be taken concurrently:

Does this course have any non-credit components?  Yes  No

If yes, indicate component(s):

- Clinical
- Discussion
- Field Studies
- Independent Study
- Internship
- Laboratory
- Lecture
- Practicum
- Research
- Seminar
- Supervision
- Thesis Research
- Dissertation Research

Indicate the instructional modes that should be available for scheduling:\*

- In Person Supplemental Web
- Field Study
- Hybrid
- Independent Study
- Web-based
- Web-based w/ on/off campus meeting
- Other

If other instructional mode, please describe and explain:

### III. Evaluation of Library Resources

A. This section is completed by the faculty member originating this proposal—indicate library resources that will be needed to support this course.

Will this course creation require changes to library resources? \*  Yes  No

Please indicate library resources that will be needed to support students taking this course:

- Core journals
- Core books (not required texts)
- Electronic resources (e.g., databases, videos, media, etc.)
- New Option

Critically needed journals for this subject area: IET Quantum Communication

Core books needed: "A Guide to Experiments in Quantum Optics" by Hans Bachor & Tim Ralph Wiley VCH October 2019, ISBN-13: 978-3527411931

Electronic Resources:

B. This section is completed by the librarian.

Level of support the Library can provide:

Library Comments:

### IV. Syllabus

# Syllabus

An accessible syllabus in Word or PDF format must accompany this form.

Graduate syllabi must meet the minimum criteria as required by the Provost's office (See Semester Memo under Executive Vice President and Provost Policies and Forms <https://www.unlv.edu/policies/current-policies>).

**Cross-listed / Combined courses have only one syllabus that includes all the information for all courses being cross-listed/combined.**


**Graduate courses that are linked to undergraduate courses (300/500 and 400/600 level joint courses) must clearly state in the syllabus how the class experience and expectations are different for graduate students, what additional requirements students enrolled in the graduate level course must fulfill, and how the grading scale will be applied to graduate students.**


Please attach an accessible syllabus by navigating to the "attach a file" icon at the right of this form.


Files Attached:\*  Accessible Syllabus

## READY TO SUBMIT?

After completing the form, please follow these steps:

1. Finish the launch of your proposal by clicking the decisions icon  located to the right of the form. This will display a new decision/approval field on the top right.
2. Click on "approve", add an optional comment if necessary, and then click on the "Make My Decision" button at the bottom to move the proposal forward to the next step. You will see a notification indicating that the proposal has moved forward. You will not be able to edit after moving the proposal forward.
3. Please note that it is your responsibility as the proposer to see that the proposal is reviewed and receives all necessary approvals. Please be encouraged to reach out to reviewers on each step, if necessary.

4. You can check the status of the proposal by clicking on the workflow status icon  to verify that the proposal has gone to the next step.

The workflow status icon  will also show you the current step of the proposal at any given time, and who are the reviewers at that step.

QUESTIONS? contact [gradcurriculum@unlv.edu](mailto:gradcurriculum@unlv.edu)

## V. Department Vote Information


Note: This section is to be filled out by the Department Chair on behalf of the department committee.

(The role has been assigned to the corresponding person on this step. If incorrect, please notify [gradcurriculum@unlv.edu](mailto:gradcurriculum@unlv.edu))

1. Review the proposal. Discuss and make appropriate revisions.

2. Fill in vote information in the fields below, along with the approval.

3. Then approve/reject by clicking the decisions icon  located to the right of the form. This will display a new decision/approval field on the top right. Click on "approve", add an optional comment if necessary, and then click on the "Make My Decision" button at the bottom to move the proposal forward to the next step. You will see a notification indicating that the proposal has moved forward. You will not be able to edit after moving the proposal forward.

The workflow status icon  will also show you the current step of the proposal at any given time, and who are the reviewers at that step.

If there were any modifications to the proposal, please enter them in the comments box below:

**Comments:**

**Date faculty voted on proposal:** 3/3/2022

**Result of vote (Number of yes/no/abstention votes):** 12-0

**Manner of vote (online, in-person, etc.):** online

## VI. College Vote Information





Note: This section is to be filled out by the Academic Associate Dean on behalf of the college/school committee.

(The role has been assigned to the corresponding person on this step. If incorrect, please notify [gradcurriculum@unlv.edu](mailto:gradcurriculum@unlv.edu))

1. Review the proposal. Discuss and make appropriate revisions.

2. Fill in vote information in the fields below, along with the approval.

3. Then approve/reject by clicking the decisions icon  located to the right of the form. This will display a new decision/approval field on the top right. Click on "approve", add an optional comment if necessary, and then click on the "Make My Decision" button at the bottom to move the proposal forward to the next step. You will see a notification indicating that the proposal has moved forward. You will not be able to edit after moving the proposal forward.

The workflow status icon  will also show you the current step of the proposal at any given time, and who are the reviewers at that step.

**Date faculty voted on proposal:** 3./25/2022

**Result of vote (Number of yes/no/abstention votes):** 4/0/0

**Manner of vote (online, in-person, etc.):** online

## VII. Graduate College and Registrar Use Only

**PS Processing Notes:**

**PS Processing Date:**

**Initials:**

**Acalog Processing Notes:**

**Acalog Processing Date:**

**Initials:**

## Comments for ECG - 614 - Quantum Communication

<b>Curriculog</b>	4/21/2022 10:25 am <a href="#">Reply</a>
Graduate Curriculum has approved this proposal on Graduate Course Review Committee.	
<b>Curriculog</b>	4/20/2022 5:12 pm <a href="#">Reply</a>
James Navalta has approved this proposal on behalf of Graduate Course Review Committee. See <a href="#">Graduate Course Review Committee 4-13-2022c</a> for more information.	
<b>Curriculog</b>	3/28/2022 10:04 am <a href="#">Reply</a>
Mohamed Trabia has approved this proposal on School/College Associate Dean/ Dean.	
<b>Melissa Morris</b>	3/25/2022 3:51 pm <a href="#">Reply</a>
approved on 3/25	
<b>Curriculog</b>	3/25/2022 3:51 pm <a href="#">Reply</a>
Melissa Morris has approved this proposal on School/College Committee.	
<b>Curriculog</b>	3/17/2022 3:06 pm <a href="#">Reply</a>
ECE Chair has approved this proposal on Department Chair.	
<b>Curriculog</b>	3/11/2022 4:35 pm <a href="#">Reply</a>
ECG Graduate Coordinator has approved this proposal on Graduate Coordinator.	
<b>Curriculog</b>	3/11/2022 2:56 pm <a href="#">Reply</a>
Graduate Curriculum has approved this proposal on Technical Review.	
<b>Curriculog</b>	3/7/2022 12:24 pm <a href="#">Reply</a>
Mei Yang has approved this proposal on Originator.	
<b>Graduate Curriculum</b>	2/14/2022 4:39 pm <a href="#">Reply</a>
<ul style="list-style-type: none"><li>- Moving back for further edits</li><li>- Meeting booked with proposer to address a few points by reviewers.</li></ul>	

**Curriculog**

2/14/2022 4:39 pm [Reply](#)

Graduate Curriculum has rejected this proposal on Technical Review.

**Curriculog**

2/9/2022 11:34 am [Reply](#)

Mei Yang has approved this proposal on Originator.

**Curriculog**

2/1/2022 10:18 pm [Reply](#)

Mei Yang has launched this proposal.