# **NEW OR REVISED COURSE PROPOSAL**

CENTRAL NEW MEXICO COMMUNITY COLLEGE

### MSE CURRICULUM COMMITTEE

**This is course is NEW / EXISTING**

|  |  |
| --- | --- |
| **Prefix, Number, and Course Title** | **ENGT 2020 Lasers and Photonics** |
| **Discipline** | **Engineering Technology** |
| **Credit Hours and Type** | **4 credits (6 contact hours; 3 hours lectures, 3 hours lab)** |
| **Proposal Originator** | **Anna Gilletly** |
| **Curriculum Liaison** | **Michael Faulhaber** |

## Proposal

**I. Description of New Course or Existing Course Change** (Include any additions, deletions, or modifications; address the impact on other schools’ offerings)

Request new HED course number.

**ENGT 2020 – Lasers and Photonics**

**Course Description**: An intermediate course stressing laser and photonic applications in science and industry. Students will learn p principles of laser operation, construction and technology. Students will learn about optical fibers and how to couple free-space lasers to single-mode and multi-mode fibers. Optical measurements will be studied with an emphasis on optical loss, coupling efficiency, and spectroscopy. The principles of various types of optical detectors and their application will also be studied.

Pre-requisite: ENGT 1020 Optics

Student Learning Outcomes

1. Differentiate between the classifications of lasers and applicable safety needs
2. Categorize laser modes, beam profile, interference, and coherence.
3. Explain the contrasting properties of optical fibers
4. Demonstrate the ability to build apparatuses to couple free-space lasers to optical fibers, to measure optical properties of materials through interference patterns, and to measure concentration using absorption spectroscopy.
5. **Justification for the Addition/Change.** (Explain the reason for the addition/change; address the impact on current students.)

Next phase of certificate expansion for the Engineering Tech program. This course will pre-align with CNM Ingenuity Quantum Technician program for CPL (credit for prior learning).

**IIa. For new courses:** List course prerequisites, or corequisites, or pre- or corequisites

Pre-requisite: ENGT 1020 - Optics

**Is this new course going to be offered every term? YES / NO**

**If this is a general education course, indicate which core area applies to the course:**

**n/a**

**If this is an Arts & Sciences course, indicate which core area applies to the course:**

**n/a**

**If this is a CTE course, indicate which core area applies to the course:**

**Engineering**

**Is this course repeatable for credit? If yes, indicate maximum credits and/or number of times course can be repeated. YES / NO**

**Will the course be delivered in person? YES / NO**

**Will the course be delivered online? YES / NO**

**Is this course currently part of the NM Common Course Numbering? YES / NO**

**Was this course developed specifically for transfer to a program(s) at a NM 4-year higher education public institution? YES / NO**

**If yes, list the institution(s), program(s), and suggested equivalent course(s):**

1. **Impact of the Change**

Consider the effects and consequences that the change might have on various stakeholders.

(a) YES or NO Will this change affect existing articulation agreements?

(**Please perform a search for all programs using the course**)

(b) YES or NO Will the change affect existing accreditations?

(c) YES or NO Will the change increase the need for additional facilities and/or equipment?

(d) YES or NO Will the change increase the need for additional faculty?

(e) YES or NO Will the change affect pre- or co-requisite considerations?

**(Please perform a search for all programs using the course)**

(f) YES or NO Will the change affect graduation requirements?

(g) YES or NO Will the change negatively affect continuing students?

(h) YES or NO Will the change increase the need for additional course offerings (sections)?

If you answer **Yes** to any item (*a through h*)*,* please use the space below to describe the effects and the actions you have taken to address them. Attach any additional paperwork and label the effects you are addressing with the letter indicating the impact you are addressing.

**IV. Course Attributes**

**Banner Attributes – highlight all that apply**

Arts & Sciences

Arts & Sciences Lab Science

Arts & Sciences Foreign Language

Arts & Sciences Literature

Capstone

Does not apply

**Does this course have work embedded learning attributes? If yes, indicate which.**

**V. Financial Aid Questions**

**Does this course fulfil a degree or certificate requirement? YES / NO**

**If yes, what degree or certificate?**

**Engineering Tech Certificate of Completion**

**Does this course have lab credit hours? YES / NO**

**Has this course been offered previously under a different name? YES / NO**

**If yes, what was the previous name of the course?**

**VI. Student Learning Outcomes**

**Please list the learning outcomes for this course.**

1. Differentiate between the classifications of lasers and applicable safety needs
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4. Demonstrate the ability to build apparatuses to couple free-space lasers to optical fibers, to measure optical properties of materials through interference patterns, and to measure concentration using absorption spectroscopy.

**Please submit a copy of the syllabus for this course along with this proposal.**

Draft - 15wk – Syllabus – ENGT 2020 – Lasers and Photonics

Pre-requisite: ENGT 1020 - Optics

# General Information

| General Information | Items |
| --- | --- |
| Instructor Name: |  |
| Email: |  |
| Office Location: |  |
| Office Phone: |  |
| Office Hours: |  |
| Course Number: |  |
| Section Number: |  |
| Semester & Year: |  |
| Credit Hours: |  |
| Campus/Rooms: |  |
| Meeting Time: |  |

## Course Description

An intermediate course stressing laser and photonic applications in science and industry. Students will learn p principles of laser operation, construction and technology. Students will learn about optical fibers and how to couple free-space lasers to single-mode and multi-mode fibers. Optical measurements will be studied with an emphasis on optical loss, coupling efficiency, and spectroscopy. The principles of various types of optical detectors and their application will also be studied.

## Required Materials

**No Required Textbook, all readings will be provided by instructor.**

## Course Student Learning Outcomes

1. Differentiate between the classifications of lasers and applicable safety needs
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## Assessments

## Schedule of Topics (tentative)

|  |  |  |
| --- | --- | --- |
| **Schedule** | **Instructional Unit (IU)** | **Science Practical Activities (SPA)** |
| Week 1 | Introduction to Lasers and Atomic Energy Levels | Laser Safety |
| Week 2 | Beam Properties: laser modes, beam profile, and coherence. | Lab: Beam characterization |
| Weeks 3-4 | Interferometry | Lab: Double slit experiment  ThorLabs Michelson Interferometer\*: measuring index of refraction and thermal expansion |
| Week 5 | Polarization – polarizers, half/quarter wave plates | Lab: Polarization |
| Weeks 6-7 | Optical intensity. Single-mode and multi-mode optical fibers | Lab: Free-space to optical fiber coupling  Lab: Optical fiber splicing |
| Week 8-9 | Optical detectors: photodiode, photomultiplier tubes, avalanche photodiodes, infrared detectors | Lab: Optical detectors |
| Week 10 | Optical spectra and emission spectroscopy | Lab: Spectrometry |
| Week 11-12 | Absorption Spectroscopy | ThorLabs Time Resolved Absorption Spectroscopy\*\*: concentration measurement |
| Week 13 | Optical Tweezers | ThorLabs Optical Tweezers\*\*: trapping microbeads |
| Week 14 | Industrial Applications of Laser and Photonics | Lab: Laser Cutting (at FUSE Makerspace) |
| Week 15 | Conclusion | Lab: Practical System Design |

\* ThorLabs Michelson Interferometer

**A machine with many objects on it

AI-generated content may be incorrect.**

\*\* ThorLabs Time Resolved Absorption Spectroscopy

**A close-up of a machine

AI-generated content may be incorrect.**

\*\*\* ThorLabs Optical Tweezers

A machine with tools and glasses

AI-generated content may be incorrect.