CERTIFICATE IN PHOTONICS & LASERS TECHNICAL SPECIALIST

OPSC 104 PHOTONICS ENABLED TECHNOLOGIES

Contact hours: Thirty (30) lecture hours & thirty (30) laboratory hours – 3 Credit

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Course Description: This course on Photonics Enabled Technologies broadens the scope of the Certificate in Photonics and Lasers by providing the student with specific applications of optics and photonics to industry related fields. As such, the student will have the opportunity to learn about specific optical and laser systems and their integration to measurement and manufacturing techniques. The laboratory component will provide the required practical experience for each of these technologies. The specific applications to be studied are: holography, fiber optics, microscopy, optical coatings, and lasers in manufacturing. Requirements OPSC102.

Competences / Objectives:

At the end of the course, the student will develop and apply the skills to:

1. Understand the various issues surrounding the ownership and operations cost of laser systems.
2. Safely work with lasers that are part of a manufacturing or measurement system, being aware of the risks involved and how to minimize them.
3. Work with electronics as part of a laser or photonics system.
4. Search for and utilize external resources to understand the principles of a specific laser-based technology and the determining control parameters that affect the desired outcome.
5. Value the importance of team work in developing technological projects.
6. Access information sources related to photonics and lasers effectively and use this information ethically and legally.

Course Content:

a. Holography

Holography fundamentals
Hologram recording
Reconstruction and Viewing of the Holographic Image
Applications of Holography

b. Fiber Optics

Geometric optics description of optical fiber
Wave optics description of optical fiber
Single-mode fiber
Optical transmitters and receivers
Modulation and demodulation of optical signals

c. Microscopy

Introduction to microscopy
Polarized-light Microscopy techniques
Material Analysis

d. Optical Coatings

Principles of Optical Interference Coatings
Coating Processes
Applications

e. Lasers in Manufacturing

Laser Welding and Surface Treatment
Laser Material Removal

LABORATORY - PHOTONICS ENABLED TECHNOLOGIES

Optics, photonics, and lasers are used in a wide variety of industries including aerospace manufacturing and R&D, biotechnology, medical devices manufacturing and R&D, communications and information technology, energy, precision machining, security, construction, research, and entertainment. This course will expose the student to applications of photonics within these industries, and to the techniques that are used. At the end of the course, the student will gain a practical appreciation of the wide array of measurement, manufacturing, and application techniques, and of the theory behind them. This course will also prepare him/her for work in industry and research at a technical level. The student will also gain knowledge of some of the resources and references that can be used in order to get a deeper understanding of these or other applications.

Laboratory Content

a. Holography

Transmission holograms
Reflection holograms

b. Fiber Optics

Fiber optics measurement techniques
Fiber optics splicing

c. Polarization Light Microscopy

d. Optical Coatings Laboratory

e. Lasers in Manufacturing: Drilling, Cutting, and Marking

Grading Policy:

30%	Two (2) partial exams
20%	Homework and class presentations
30%	Laboratory logbook
20%	One (1) comprehensive final exam

Textbook: Lee, C. (Ed.). (2015). *The Current Trends of Optics and Photonics* (Topics in Applied Physics) (p. 542). USA: Springer.

References:

a. Printed Resources

National Center for Optics and Photonics Education OP-TEC. (2008a). *Laser Material Removal: Drilling, Cutting, and Marking*. Waco, TX: Cord Communications.

National Center for Optics and Photonics Education OP-TEC. (2008b). *Laser Welding and Surface Treatment*. Waco, TX: Cord Communications.

Unterseher, F., Schlesinger, B., & Hansen, J. (2010). *Holography Handbook: Making Holograms the Easy* Way (3rd ed., p. 408). USA: Ross Books.

Yariv, A. & Yeh, P. (2006). *Photonics: Optical Electronics in Modern Communications* (p. 848). USA: Oxford University Press.

b. Audiovisual Resources

OP-TEC. (Producer). (2014). *Quality Assurance of Precision Optics Series*: *Quality Assurance of Precision Optics Series*. [Video file]. Retrieved from http://www.optecpos.opteccrm.org/QAPO/lab-videos/index.php

Students with Special Needs (ADA):

Students receiving Vocational Rehabilitation services, who present evidence, should communicate with his/her professor at the beginning of the semester to arrange for reasonable accommodations and the necessary assistance equipment. Any student needing any special accommodations should communicate these needs to the professor during the first week of class.

Equal Opportunity: Universidad Metropolitana (UMET)provides equal education and employment opportunities and does not discriminate on the basis of race, color, religion, sex, gender, gender identity, real or perceived sexual orientation, national origin, military status, status as protected veteran, physical or mental disability, social condition, age, marital status, political ideologies, domestic violence or sexual attack victim status, or any other characteristic protected by federal, state, or local law. Disabilities: Services are available to students who may need accommodations, interpreters, and/or specialized equipment. All student requests are dealt in confidential manner.

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