NOMBRE DE LA ASIGNATURA O UNIDAD DE APRENDIZAJE

FIBRAS ÓPTICAS ESPECIALES (SPECIAL OPTICAL FIBERS)

CICLO	CLAVE DE LA ASIGNATURA
OPTATIVA	**EFI05**

OBJETIVO(S) GENERAL(ES) DE LA ASIGNATURA

To present for students some short basic conceptions of glass physics, some basic conceptions of optical fiber fabrication with a main emphasis on fabrication of special photonic crystal (or microstructured) fibers. Theoretical courses are synchronize with a practice on fabrication and characterization of special photonic crystal fibers

TEMAS Y SUBTEMAS

1. Physics of a glass
- 1.1 Crystallization, and how to ovoid it
- 1.2 Glass transition
- 1.3 Making silica glass
- 1.4 Silica and light

2. Classes of photonic crystal fibers
- 2.1 Index guiding fibers
  - 2.1.1 High numerical aperture fibers
  - 2.1.2 Large mode area fibers
  - 2.1.3 Highly nonlinear fibers
- 2.2 Bandgap Guiding Fibers

3. Fabrication of special optical fibers
- 3.1 Methods of fabrication
- 3.2 The fiber tower (CIO)
- 3.3 Furnace, Element Designs and Hot Zone
- 3.4 Drawing of capillaries
- 3.5 Fiber fabrication
- 3.6 Fabrication of special optical fibers in CIO

4. Characterization
- 4.1 Number of modes
- 4.2 Using a microscope
- 4.3 Near and far field patterns
- 4.4 Attenuation measurements, cutback and OTDR, side-scattering measurements
- 4.5 Modal cutoff
- 4.6 Bend loss
- 4.7 Birefringence

5. Functional PCF sensors
- 5.1 PCF sensors fabricated by tapering techniques
- 5.2 PCF sensors fabricated by splicing

6. Safety at fabrication of special optical fibers
- 6.1 Hazards (chemicals, gases, compressed air, hot material, glass, items falling, moving machinery, tripping and falling)

ACTIVIDADES DE APRENDIZAJE

i) **Frente a docente:** Se cubre un total de 28 sesiones de una hora y media a la semana con la participación activa del estudiante, a través de preguntas, aportación de ejemplos y desarrollos algebraicos en clase. Los conceptos básicos se pueden reforzar con las siguientes sesiones en el laboratorio:

- Exercise #1 and 2
  Special optical fiber geometrical parameter measurements by using an Optical Video Microscope.
- Exercise #3 and 4
  Special optical fiber optical parameter measurements by using an Optical Time Domain Reflectometer (OTDR).
- Exercise #5 and 6
  Special optical fiber attenuation measurements by using Cutback Method.
- Exercise #7

Splicing of PCF and standard fibers
- Exercise #8
  Evaluation of PCF parameters.
- Exercise #9 and 10
  Stuck design calculation.
- Exercise #11 and 12
  Drawing of capillaries.
- Exercise #13 and 14
  PCF stuck preparation.
- Exercise #15-17
  Drawing of PCF fibers.
- Exercise #18-22
  Characterization of fabricated PCFs.

ii) **Independientes**: El estudiante realiza tareas diversas fuera del aula, como solución de problemas algebraicos y numéricos, lectura y análisis de artículos de investigación y referencias bibliográficas.

CRITERIOS Y PROCEDIMIENTOS DE EVALUACION Y ACREDITACION

El curso se evalúa de acuerdo a los siguientes conceptos: tareas, prácticas y reporte de laboratorio, exposiciones, investigación, exámenes y asistencia. El porcentaje para cada uno de estos puntos, será criterio del docente.

BIBLIOGRAFÍA

1. A. Bjarklev, J. Broeng, A.S. Bjarklev, Photonic Crystal Fibres, London: Kluver Academic Publishers, 2003.
2. N.P. Bansal and R.H. Doremus, Handbook of Glass Properties, 2012.
3. U. Minkovich, Special Photonic Crystal Fibers: Modeling, Fabrication and Application, Lambert Academic Publishing, 2011.
4. M. Vaca Pereira Ghirghi, “Design, fabrication and investigation of special microstructured fibers”, Ph.D. Thesis, Leon, 2016