



University  
of Victoria

Graduate Studies

Notice of the Final Oral Examination  
for the Degree of Master of Applied Science

of

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BE (Visvesvaraya Technological University, 2012)

**“Hollow Fiber Coupler Sensor”**

Department of Electrical and Computer Engineering

Wednesday, December 12, 2018

9:30 A.M.

Engineering Office Wing

Room 430

Supervisory Committee:

Dr. Tao Lu, Department of Electrical and Computer Engineering, University of Victoria (Supervisor)

Dr. Poman So, Department of Electrical and Computer Engineering, UVic (Member)

External Examiner:

Dr. Rustom Bhiladvala, Department of Mechanical Engineering, UVic

Chair of Oral Examination:

Dr. Steve Perlman, Department of Biology, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

## **Abstract**

This thesis presents a method to fabricate a robust optical directional coupler sensor using a solid core fiber (SCF) and a hollow core fiber (HCF). Through evanescent wave coupling mechanism, the optical power is exchanged between SCF and HCF. The hollow core of the HCF can be filled with liquid samples to alter the coupling ratio which imparts change in amount of light propagating through the SCF. Thus, it gives the coupler with ability of sensing refractive index of the sample with good sensitivity of  $4.03 \pm 0.50$  volts per refractive index units (V/RIU) for refractive indices ranging from  $1.331 \pm 0.003$  to  $1.403 \pm 0.003$  with a resolution of  $3.5 \times 10^{-3}$  refractive index units (RIU). The SCF-HCF coupler was also used to sense the temperature based on the concept of temperature dependence on refractive index of the sample inside the hollow core of HCF. Further, the packaging methods are described that protect coupler from ambient environments and improves the life span of sensor.