Please attend the proposal defense of Michael Davis, a Master's Degree candidate in Physics & Engineering and an advisee of Dr. Mohammad Khan. His proposal defense will be on:

Date: 15-Nov-2016
Time: 11:00 am -12:00 noon
Location: Mishoe Science Center South Room 212

DEVELOPMENT OF HIGH-RESOLUTION AND HIGH-PRECISION LASER-BASED SENSOR FOR MEASUREMENT OF ATMOSPHERIC METHANE

Michael E. Davis, Jr.

Faculty Advisor: Dr. Amir Khan

Abstract:

Observations of a general warming trend in the earth's atmosphere over the last several decades have been attributed to an increase in the emissions of greenhouse gases largely from anthropogenic sources. Global industrial development has led many human activities with externalities – both positive and negative to the environment. Therefore, it is imperative understand precise nature of greenhouse gas emissions, their sources and sinks, and their geographical and temporal variations over the globe. In many cases there is huge uncertainty in sources and emissions on several greenhouse gases mainly methane and nitrous oxide. This thesis outlines design and development of portable travel gas sensor to measure atmospheric methane. The sensor technology developed in this thesis is low-power, suitable for deployments in diverse platforms including mobile ground-based and small unmanned aerial systems (UAS). In addition, the technology can be extended to ubiquitous sensor networks for continuous monitoring of the environment and measure precise estimates of carbon cycle and anthropogenic activities that affect the ecosystem. In this thesis we describe the scientific innovation involved in sensor development using 2f-wavelength modulation spectroscopy detection of molecular methane in the infrared region of the spectrum. We show that the developed prototype has overall volume of 35 cubic inches, mass of 3 Kg and total electrical power consumption of 20 W. The long term laboratory precision is 2.6 % at 1-second sampling rate which is uncertainty of approximately 47 ppbv over the background methane of 1800 ppbv.