**Graduate Course APS 1037H – Fall 2016:**

**Infrastructure Engineering in Remote First Nation Communities in Ontario**

There are 29 First Nation communities in Northwestern Ontario that are beyond the northern limits of the road system. Many of these communities rely on winter ice roads for shipping, as supplies of all kinds, from building materials, fuel, consumer goods and vehicles, are much cheaper to import by ice road than by the alternative, air transport.

The season for reliable ice roads is much shorter now than in past decades. Fuel supplies pose a particular challenge as local power generation is based on diesel-fired generators. Communications technologies face challenges of remoteness, harsh climate, and a small user base. Waste management options are limited because garbage only flies in, never out. Water and wastewater services are notoriously underperforming their southern counterparts. Schools are routinely closed for fuel spills and contamination issues. Buildings burn down for lack of firefighting services. Housing is mouldy and overcrowded. It’s a long list of problems. What have engineers learned from past experiences?

With big plans for developing mineral resources in the territory, decisions about infrastructure development will need to take into account what has or hasn’t worked, and how innovation, better planning and community collaboration can meet the challenges of the remote conditions. Government contracts for engineering services, and construction and resources projects of all kinds, constitute a significant expenditure each year, and many “southern” engineering students may be working on remote projects in their future careers. How can engineers make a positive difference?

This course is proposed to give an introduction to future engineers of the unique challenges posed by the geography, history, politics, climate, funding regime, culture, legal rights, and the legitimate expectations of a good life, of the people who live in the communities.

**Who Can Take This Course?**

As a survey course, this is suitable for interested graduate students of any of the engineering disciplines, physical geography, and planning.

**Topics**

History, the Indian Act, Treaty 9, communities and political structure, funding

Evaluating engineering options – Life Cycle Analysis and other tools

Water and wastewater services – 1

Contaminated sites – History, regulations and technology

Waste management/reduction/recycling

Water and wastewater services – 2

Transportation, winter roads, airports, proposed all-weather road network

Energy needs and power generation/transmission/distribution

Housing, education and health - the buildings and facilities

Emergency preparedness and first response

Communications, telephony, internet, radio and television

Resource development

Population projections, economic development and employment

**Learning Outcomes**

Understand the physical setting and the political and financial constraints that limit infrastructure development in remote First Nation communities in the Treaty 9 area of Ontario.

Critically evaluate existing infrastructure and its suitability for current and future community residents, and proposed new development to accommodate resource development.

Apply the knowledge of place to compare and evaluate engineering options for future developments considering sustainability and global efforts to limit carbon emissions.

Develop skills in acquiring information, evaluating, discussing, synthesizing and reporting on infrastructure in remote First Nations communities.

**Format**

One three-hour session per week. Each class will have three parts;

* a weekly topic with a short topical lecture and directed discussion based on assigned readings,
* a guest presenter (subject matter experts; consulting engineers with field experience, government officials with funding-decision-making experience, elected First Nation officials (past and present), or community members, followed by an opportunity for class discussion, and
* a Challenge Exercise, an Instructor-led problem-solving challenge or engineering group-work exercise, submitted in class.

**Expectations**

In addition to class time (3 hours/week), there will be 1 – 2 hours of assigned readings before each class, and three short project reports – two done as in-class presentations, the other as an individual report (5 pages in length). Group submissions of challenge exercises done in class.

**Evaluation scheme**

Participation in class discussion – 20%, Classroom presentations of projects (2) – 2x20%, Topical report – 20%, Challenge exercises – 20%.