



Monterey Institute of International Studies

A Graduate School of Middlebury College

Graduate School of International Policy & Management

COURSE SYLLABUS – FALL 2013

NPTG8533: Geospatial Tools for Nonproliferation Analysis – 1 Credit

22 November 6:00-9:00pm
23 November 9:00am-5:00pm
24 November 9:00am-3:00pm

Location: McGowan MG100

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Course Website: <http://sites.miis.edu/geospatialtoolsfall2013/>

COURSE DESCRIPTION

This course serves to introduce students to the increasingly important role of imagery analysis in nonproliferation. Students will receive a background in the rise of commercial satellite imagery and its open-source intelligence applications. They will learn basic techniques for identifying nuclear- and missile-related facilities by using their knowledge of how these facilities work, ground photos, and crowd sourcing. Students will also learn how to order and manipulate satellite imagery in Google Earth and SketchUp in order to derive new value-added information for their research.

COURSE OBJECTIVES

Students successfully completing this course will be able to:

- Know the basics of the imagery analysis process and how it can be applied commercial satellite imagery for nonproliferation analysis
- Acquire commercial satellite imagery
- Identify some basic nuclear and missile related equipment, processes, and infrastructures
- Map and model nuclear and missile related equipment and facilities

TEXTBOOKS AND OTHER MATERIALS

Recommended:

1. Frank V. Pabian, [Commercial Satellite Imagery: Another Tool in the Nonproliferation Verification and Monitoring Tool-Kit](#), • chapter 12 in the [Nuclear Safeguards, Security and](#)

Nonproliferation Textbook, 2008. (On eReserve, password: fa13hanham8533). [Bibliography of Imagery Analysis and Annexes](#) from: www.elsevierdirect.com.

2. Nick Hansen [“Major Construction Progresses at Sohae: Possible Prep for Mobile Missile Systems,”](#) *38 North*, 28 October 2013, www.38north.org.
3. Nick Hansen, [“Space Oddity – New Developments in Iran’s Missile and Space Infrastructure,”](#) *Jane’s Intelligence Review*, 7 August, 2013.
4. Tamara Patton, [“Combining Satellite Imagery and 3D Drawing Tools for Nonproliferation Analysis: A Case Study of Pakistan’s Khushab Plutonium Production Reactors,”](#) *Science & Global Security*, October 2012, 20:2-3, 117-140.

METHODOLOGY AND POLICIES

This workshop will provide the student with an introduction to the increasingly important role of overhead reconnaissance. It can be used to substantially augment existing information gathering techniques, procedures, and analyses involving the remote detection of undeclared facilities, as well as support ongoing monitoring and verification of various treaties, relevant activities and programs.

The workshop will be divided between instructional sessions and practical hands-on exercises using Google Earth and Trimble SketchUp to enable the student for future independent research. The instructor will teach on a PC platform, and offer a handout for shortcuts for mac users.

Because the lecture will involve proprietary images belonging to DigitalGlobe, Astrium, and others, the instructors request that there is no video recording or photos taken during the workshop.

ACADEMIC CONDUCT

All students will be held to policies and procedures listed in the most current Policies and Standards Manual (PSM). This includes, but is not limited to, our Student Honor Code and regulations on plagiarism. A complete copy of the Policies and Standards Manual (PSM) can be found here: (http://www.miiis.edu/media/view/23925/original/policy_and_standards_manual_update.pdf).

REQUIREMENTS AND GRADING

REQUIREMENT: Each student is required to bring a Wi-Fi Internet enabled laptop to class with the latest version of Google Earth and SketchUp Make already installed. They can be downloaded from: www.google.com/intl/en/earth/index.html and www.sketchup.com/download. Please also bring a mouse with a scroll wheel so that you can navigate Google Earth and SketchUp quickly. If you do not have one, you can borrow one from Media Services (limited supply).

GRADING: The workshop is graded on a pass-fail basis. It should be kept in mind, however, that students are expected to be familiar with the reading and participate in class discussions and exercises. Mere attendance is not sufficient to merit a “pass.” If anyone anticipates an unavoidable absence for all or part of class on a given day, please discuss this with the instructors in advance.

SCHEDULE

Friday

6:00-6:30pm:

Introductions
Course Requirements

6:30-7:30pm:

Introduction to Imagery analysis

- What's available
- Uses and limitations of imagery
- Types of sensors

BREAK

Optional: play [Geoguessr](#)

7:45-8:50pm:

Exercise: "Buy" Some Imagery

Saturday

9:00-10:00am:

Google Earth Boot Camp

- Searching
- Using place marks, paths, and polygons
- Using the time slider
- Conducting measurements
- Image overlays
- Organizing your information in 'My Places'
- Overview of KMZ files (saving and sending)
- crowd-sourcing: Wikimapia, GE Gallery, GE Community, Panoramio, Flickr

10:00-10:45am:

Introduction to identifying missile facilities

- What does a missile program need?
- What can we see?
- Overview of facilities & equipment

BREAK

Optional: nuke your (least) favorite city with [NUKEMAP](#).

11:00am-12:00pm:

Case Studies

- Iran: Semnan & Shahrud
- North Korea: Sohae & Tonghae

LUNCH

1:00-2:00pm:

Introduction to identifying nuclear facilities

- What does a nuclear program need?
- What can we see?
- Overview of known facilities & equipment

2:00-2:45pm:

Case Studies

- North Korea: 5MW Reactor
- North Korea: Punggye-ri test site

BREAK

Optional: [Sleuth from the internet](#) and monitor seismic activity for nuke tests.

3:00-4:50pm: QUIZ

Annotate a map of THIS facility (Will posted at time of quiz)

Sunday

9:00-10:00am:

SketchUp Boot Camp

- Navigation with a scroll wheel mouse
- Orbit, zoom, and pan
- Pencil
- Shapes
- Arcs
- Push/Pull Tool
- Tape measure and grids
- Moving
- Scaling
- Components and Groups
- Follow-me tool
- Move tool
- 3D warehouse
- Geo-location
- Texturing (Downloading [free textures](#))
- Exporting models to Google Earth

BREAK

Optional: take action with a [Tomnod](#) campaign.

10:30-11:30am:

Exercise: modeling Pelindaba's Building 5000

Location: 25°48'39.97"S 27°55'31.28"E

Ground Image: [Photo](#)

- Measure height using shadows
- Texture using ground photos

LUNCH

12:30-2:30pm:

Exercise: Build a facility of proliferation concern

- Geo-locate the facility
- Model & texture facility
- Export model to Google Earth
- Email the KMZ to the instructors

3:30-3:00pm:

Review, final Q&A, and evaluations