Global Seminar (Physics 4993): Science and Technology in the Middle East
May Term 2010
Syllabus

Instructor: Marvin L. Marshak, Institute of Technology Professor and Morse-Alumni Professor

Grade Scale and Credits: A-F only, 3 credits

Prerequisite: Instructor Consent

General Course Information:
Class Time: 30% lectures, 70% site visits
Workload: 25 hours per week class and site visits; reading, report writing; Oral presentations

Course Goals:

Goal 1. To increase students’ understanding of economic, cultural, political, geographic, educational and other factors that facilitate or impede the development of science and technology in a particular country or region.

Goal 2. To increase students’ understanding of the role of science and technology in addressing resource constraints, particularly energy, water and arable land, in resource-limited countries, such as many countries in the Middle East.

Goal 3. To increase students’ understanding of the geography, history and culture of the Middle East, particularly, Israel and Jordan, in order to provide a context for achieving Goals 1 and 2.

Course Overview:

There is arguably no region in the world outside of our own country that plays a larger role in the American consciousness than the Middle East. American troops have fought three wars in this region in recent memory. Two of them are still in progress. We have challenging relationships with other countries in the region, including Iran and Pakistan. Our lives at home have been affected much in the past decade by threats of terrorism originating from grievances associated with this region. Yet, most American college students know little about the Middle East, its geography, history and culture.

The Middle East is also a unique region in the context of science and technology. The region generally lacks water and arable land. The distribution of energy resources is dichotomous. Some countries have huge petroleum and natural gas surpluses. Others are desperately short of energy resources. Science and technology, if it can be developed appropriately, offers considerable benefits to the countries in the Middle East. However, various factors make such development problematic. Can American scientists and engineers participate positively in the development of scientific and technological infrastructure in the Middle East? The goals of this proposed course are to better understand this region, how it has
been affected by science and technology and what science and technology might be able to do to improve the lives of its people.

Israel and Jordan are neighboring countries in a historically sensitive area of the Middle East. Indeed, at times they were one country. That country was then divided by a British colonial regime for its own political purposes. Geographically, the countries are quite similar, comprising two sides of the same rift valley, except for the Israeli Mediterranean coastal plain, which has no analog in Jordan. Economically, the countries are very different (2008 World Bank estimate of per capita income: Israel $24,700; Jordan $3,310). Israel has a strong science and technology infrastructure. Jordan is seeking to develop one. Thus, Israel and Jordan provide a unique laboratory for study of factors that facilitate science and technology, as well as outcomes of scientific and technological development.

This class will include visits and discussions with scientists and engineers at university and industrial sites in Israel. Of particular interest in Jordan is the region around Aqaba, where the U.S. Agency for International Development is working with Jordanian government to promote a Special Economic Zone with technology industry and new university. The class will also visit some historic sites to achieve a better understanding of the historical context that continues to shape culture and politics in the Middle East.

Course Schedule and Assignments:

Before Leaving the United States:

          Handouts provided by Instructor and Guest Lecturers

Required Classes (7:00 p.m. to 8:40 p.m.):

January 27, 2010: History and Geography of the Middle East with emphasis on Palestine, Israel and Jordan
February 10, 2010: Technology Leadership and Technology Transfer
February 24, 2010: Focus on Technology Areas: National Defense, Semiconductors
March 10, 2010: Focus on Technology Areas: Biomedical Technology, Software
March 24, 2010: Focus on Technology Areas: Water Desalination, Solar Energy, Student Reports
April 7, 2010: Economic Development Programs and U.S. Agency for International Development; Student Reports
April 21, 2010: Hebrew and Arabic Primer; Student Reports

Grading:

1. Write a preliminary, one page report on a topic selected from a list that will be provided at the first class meeting (10%)
2. Pre-departure Student Report on a Site to be Visited (5-7 minutes) (10%)
3. Journal: brief description of site visits, submitted at the end of the course (20%)
4. Post-Visit Site Report Addressing Questions in Syllabus for One Site (20%)
4. Final (4-5 page) report; integrated discussion addressing student’s understanding regarding at least one Course Goal as listed in the Syllabus; due 2 weeks after return (20%)
5. Quizzes on assigned readings (15%)

Site Visits:

Typical questions to be addressed at each site are listed below.

[Note: The work week in Israel is Sunday through Thursday. Friday is a “light work” day, with early closings on Friday afternoon. Friday evening and Saturday before sunset is the Sabbath, with many closings. Visits to work sites will generally occur during the work week, with visits to public, historic sites scheduled for Fridays and Saturdays.]

Work Sites: (To be selected from the lists below)

Universities:
- How does this university contribute to the development of science and technology in Israel or Jordan, the Middle East and the world?
- What is the impact of resource constraints (energy, water, arable land, finances) on the contributions of this university?
- What is the impact on this university of the history and politics of Israel or Jordan and the Middle East?
- How is this university and its student experience similar to/different from that of a university in the United States?

Hebrew University (May 23)
Weizmann Institute of Science (May 25)
Tel Aviv University (May 26)
Technion (May 27)
Ben Gurion University (May 30)
Aqaba University of Technology (June 2)
University of Jordan (June 6)

Technology Transfer:
- How is this technology transfer company similar to/different from other technology transfer institutions in Israel or elsewhere?
- How does this technology transfer company contribute to the development of science and technology in Israel or Jordan, the Middle East and the world?
- What is the impact of resource constraints (energy, water, arable land, finances) on technology transfer?
• What is the impact on technology transfer of the history and politics of Israel or Jordan and the Middle East?

Hadasit (May 23)
Yissum (May 24)
Ramot (May 25)
T3 (May 27)
BGN Technologies (May 30)

**Multinational Companies:**
• What types of research and development activities are done here?
• Why has this company chosen to locate research and development activities in the Middle East?
• How are research and development activities here similar to or different from similar activities in the United States or other parts of the world?
• Does this laboratory or company make special efforts to address resource or other challenges or constraints associated with the Middle East?

Intel Jerusalem (May 23)
IBM Jerusalem R&D Labs (May 24)
Intel Petach Tikvah (May 24)
IBM Innovation Center (May 24)
Microsoft Herzliya (May 26)
Hewlett Packard (May 27)
Google (May 27)
Yahoo (May 28)
Intel Qiryat Gat (May 30)
Veolia Water (May 30)

**Israeli Companies:**
• What types of research and development activities are done here?
• How are Israeli technology companies similar to/different from technology companies in other parts of the world?
• Does this laboratory or company make special efforts to address resource or other challenges or constraints associated with the Middle East?
• What factors in Israel encourage/discourage the development of technology companies?

Teva Pharmaceuticals (May 24)
Skuku (May 24)
Israel Aircraft Industries (May 25)
Music Genome (May 25)
Aora Solar Technology (June 1)

**U.S. Agency for International Development—Jordan (June 2)**
• How does the United States foster the development of technology abroad?
• What particular challenges does U.S.A.I.D. encounter in Jordan and the Middle East? What strategies are used to mitigate these challenges?
• What are the history and prospects for the Aqaba Special Economic Zone? What lessons learned here can be applied elsewhere?
• What are the plans for the Aqaba University of Technology and how do these plans relate to the overall policies of the ASEZ?

Historic Sites:
Visits to historic sites will primarily occur on Fridays and Saturdays when businesses and offices are closed. Site visits will focus on the historic development of technology, particularly civil engineering and urban infrastructure. Some attention will also be directed to the unique geology of the region.

Jerusalem Old City (Iron Age, Roman, Medieval) (May 21)
Masada (Roman) (May 22)
Dead Sea and Rift Valley (Geology) (May 22)
Qumrun (Iron Age) (May 22)
Caesarea (Roman) (May 29)
Petra (Iron Age and Roman) (June 3)
Amman (Greek, Roman and Medieval) (June 5)
Jerash (Roman) (June 5)