Course “Space Sector”

Instructors:
Professor Edward Crawley
crawley@mit.edu
Dr. Tatiana Podladchikova
t.podladchikova@skoltech.ru

Teaching assistants:
Natalia Glazkova
Natalia.glazkova@skolkovotech.ru
Sophia Karolina Salas Cordero
SophiaKarolina.SalasCordero@skolkovotech.ru

Guest lecturers:
Professionals from among the acting or former leaders of the NASA, Roscosmos, and ESA, founders of aerospace companies, and heads of the world’s leading research organizations.

OVERVIEW
This course examines the domain of space from multiple vantage points — space as a business, a way of life, as industry, and as a fulfillment of human dreams. In addition, it examines space-related issues that drive key international regulatory, economic, and global policy. To gain insight into these different dimensions, we examine space through three different lenses: sub-sectors, technologies, and organizations.

Part 1: History and Organizations
- History
- Space Sector Agencies, Organizations and Plans
- “New Space”

Part 2: Sub Sectors
- Launch services and markets
- Satellite manufacturing and operations, including sensors and payloads
- Earth observation and geodesy
- Space communications and navigation services
- Space science payloads and missions
- Human spaceflight, programs and policies

Part 3: Technologies:
- Technology readiness, and sources of technology, technology planning
- Launch technologies and options
- Satellite technologies
- Payload technologies
Space Robotics

In addition, we cover several tools helpful in exploring a sector: system thinking, critical thinking, the economics of a firm, how firms compete and the value chain in the development of a product.

Because of the availability of speakers, the course schedule does not exactly follow this outline. In addition, some speakers may cover both a sector and its technology (e.g. launch sector and launch technology).

Learning Outcomes

The learning outcomes are that a student should be able to

- Describe the main sub-sectors or services within the space business
- Analyze the main technologies employed and assess the technological barriers
- Estimate the parameters of the business models of each of the sub-sectors, and where value is generated and how, including traditional and “new” space
- Describe the funding of R and D, regulation and government programs in space
- Characterize the national differences in demand for space services and capability to build and operate national programs, and contribute to international efforts.
- Integrate into an analysis that indicates desirable segments for future commercial and national development.
- Propose potential products, and critically analyze their potential success in the market