

SB 2022 Study Abroad – Athens, Greece
ENCE489G Sustainability & Infrastructure

March 18 – 27, 2022

Program Dates:

UMCP Workshops & Pre-Departure Meeting: TBD (to be scheduled at the beginning of March)

US Departure: March 18, 2022

Athens, Greece: March 19 – 27, 2022.

Program Director

Dr. Dimitrios Goulias, Associate Professor

Course Description

With the rapid world's population growth and the transition from rural to urban living over 50 percent of the population is now living in cities. By 2050, it is predicted that nearly 70 percent of the world's population (about six billion people) will be living in urban areas. Large cities represent only two percent of the world's surface area, yet are the economic drivers of the world's economy accounting for over 80 percent of the world's gross domestic product (GDP). With these staggering statistics the concepts and principles of "Sustainable Infrastructure" are vital for the survival of urban settlements and the development of healthy living conditions, along with economic prosperity. Thus, the concepts of "Sustainability" are in the forefront of planners, designers, engineers, environmentalist, citizens and users for achieving a functional, cost effective, resilient and healthy city for an improved urban experience. "Sustainability" include among other:

- **Infrastructure Components:** Green Infrastructure (green buildings, green roads, and other components); Energy Systems and Energy Conservation; Recycling and Waste Reduction; Water Network and Water Conservation; Monitoring Systems and Sensors; other.

Athens represents a challenging city due to the high concentration of Greek population (more than 40%) and government services, social challenges due to the significant migration, and the current economic challenges. Thus, the implementation of sustainability principles in the further development of infrastructure components is critical. The specific history and cultural heritage of the city provides unique challenges and complexity in such effort.

Theoretical Framework

This study abroad course will expose students to the theoretical principles, framework, and techniques required to address the development of sustainable infrastructure (i.e., highways, bridges, tunnels, dams, ports, airports) complex spatial systems encompassing mobility, environment, energy, and social well-being. The course will deal with the identification of a set of qualitative/quantitative indicators and methodologies. The course will address with key faculty experts speakers from the US and Greece, the principles of technical, cultural and social approaches used in the design of sustainable infrastructure, including among other:

Instructors

University of Maryland

Department of Civil and Environmental Engineering.

- Dr. Dimitrios Goulias, Associate Professor. (Program Director).

University of the Aegean

Department of Shipping Trade & Transport

- Dr. Amalia Polydoropoulou, Professor.

National Technical University of Athens (NTUA)

Department of Civil Engineering

- Dr. Andreas Loizos, Professor.

Technical Chamber of Engineers (TEE/TMEDE)

Speaker(s) TBA: “Sustainability Requirements for Infrastructure.”

Topics (tentative)

Sustainability, Livability, Resilience

Sustainability & Infrastructure: Principles & Design

Sustainability and Green Infrastructure

Green Buildings & LEED

Green Roads Components & Sustainability Metrics

Fundamental Steps of Sustainability Analysis: The Case of Green Roadways

Condition Assessment: Methods and Ratings

Structural Design Principles & Methods

Sustainable Rehabilitation Methods

In-situ Recycling Principles & Methods (condition, materials and techniques)

Principles and Design of Permeable vs Impermeable Surfaces

Ex-situ Recycled Materials and Alternative “Green” Materials

Life Cycle Assessment and Life Cycle Cost Analysis, LCA/LCCA for Conventional & Sustainable Alternatives & Tools (Palate)

Environmental Assessment Analysis & Tools: GHG Emissions, RCRA Hazardous Waste, Energy Analysis, Water Consumption, GWP –Global Warming Potential, Noise Analysis, (BE²ST)

Highway Sustainability Rating Method (BE²ST in Highways)

Optimization Analysis of Sustainable Alternatives & Selection of Best Solution

Guest Lecturers in Greece on topics pertinent to: “Sustainability & Infrastructure.”

Case Study & Design Projects

Athens is a member of the “100 Resilient & Sustainable Cities” and the *Integrated Climate Action Plan C40* (40% greenhouse gas emissions reduction by 2030) initiative of cities around the world. Furthermore a major European competition initiative was undertaken to convert Athens to a Sustainable and Resilient City, “*Rethink Athens.*” Thus students will be exposed into these plans and will develop their sustainable design projects in locations pertinent to such initiatives.

Project Site Location & Pertinent Information: Rethink Athens Project & Plateia Klafthmonos



1. Rethink Athens: European Architectural Competition: Resilience & Sustainability

<http://www.rethinkathenscompetition.org/competition.php#Proposal2>

OKRA Project Information: Rethink Athens- Transformation of Athens New City Center

<https://www.archdaily.com/338001/re-think-athens-winning-proposal-okra/>

Tech Report

http://www.rethinkathenscompetition.org/uploads/proposal_entries/pdf_results_2/AB30273512/Rethink%20Athens_2-AB30273512-11.pdf

2. Athens Urban Resilience & Sustainability Challenge, 100 Resilient Cities

http://www.100resilientcities.org/wp-content/uploads/2017/06/Athens_Resilience_Strategy_-_Reduced_PDF.compressed.pdf

3. Athens' Integrated Climate Action Plan C40 (40% greenhouse gas emissions reduction by 2030)

http://www.c40.org/cities/athens/case_studies

http://www.c40.org/case_studies/athens-plans-for-a-greener-and-cooler-city

Site Visits & Events (tentative)

- Urban Walk (includes broader area of downtown Athens & several of the sites below)
- Syntagma Square & Metro Station/Museum
- National Gardens, Zappion
- Panathenaic Stadium (All-Athenian/ Kalimarmaro, rebuilt in 1896)
- Hadrian's Arch & Temple of Olympian Zeus
- New Acropolis Museum
- Acropolis, Parthenon, Erechtheion, Temple of Athena Nike
- Odeon of Herodes Atticus
- Ancient Agora, Temple of Hephaestus, Stoa of Attalos
- Roman Agora, Hadrian's Library & Tower of the Winds
- Thiseion District, Plaka, Monastiraki & Byzantine Monastery
- The Academy of Athens (Greece's National Academy)
- Mount Likavitos (Lecabettus);
- Stavros Niarchos Foundation Cultural Center (Sustainability)
- Athens Metro – Piraeus Construction Site
- O.A.K.A. Olympic Athletic Center of Athens 'Spiros Louis'
- Field Trip: 3 Island Cruise: Hydra, Poros, Aegina
- Field Trip: Korinthos Canal, Rio Antirrio Bridge, City of Nafplio

Course Schedule (tentative)

UMCP Workshops & Pre-Departure Meeting: TBD (to be scheduled at the beginning of March)

US Departure: March 18, 2022

Travel Dates:

-March 18: Departure from US.

-March 19: Arrival in Athens, Airport transfer to Hotel Registration.

On-site orientation & site visits, welcome dinner.

-March 20: Urban Walk & Athens Site Visits.

Program Overview, Logistics

Design Projects

-March 21: Workshop Sustainability & Infrastructure

Design Projects Site Visit, Logistics & Analysis

Site Visit Athens Olympic Infrastructure

-March 22: Workshop/Guest Speakers Sustainability & Infrastructure

Design Projects Logistics & Analysis

Site Visit Athens Metro Construction

-March 23: Workshop/Guest Speakers Sustainability & Infrastructure

Design Projects Logistics & Analysis

Site Visit Niarchos Center Sustainability Infrastructure Complex

-March 24: Field Trip: Korinthos Canal, Rio Antirrio Bridge, City of Nafplio

-March 25: Presentation of Design Projects, Course Assessment

Concluding Remarks.

-March 26: Field trip 3 Greek Islands Cruise: Aigina, Poros, Hydra

-March 27: Airport Transfer & Return to the US.

Course Location

Students will be lodged in a 4-star hotel in Athens and will be using lecture rooms.

Learning Objectives

Students in this course will:

- gain knowledge on the principles and techniques for the design of sustainable infrastructure components;
- be exposed to the complex and multi-disciplinary analysis required for such projects and account for the physical characteristics of the space, the historic and cultural identity of cities, as well as the environmental aspects;
- be exposed to and learn of the set of qualitative and quantitative indicators used in the design of “green infrastructure;”
- apply principles and techniques on case studies.

Learning Outcomes

By the end of the course, students should have attained competency (ABET) in the following areas:

- participatory decision making within a team;
- creating design alternatives based on community needs assessment, and cultural identity;
- creating and analyzing multiple design alternatives;
- determining appropriate techniques and methods to be used in solving societal needs mingled with engineering and environmental principles;
- determining metrics for design projects.

Proposed Texts.

None. Readings or other resource materials will be provided by the participating faculty.

Course Prerequisites.

None. The course is open to any major, undergraduate and graduate students, as well as non UMD students.

Participation.

The students will be working in teams to conduct their design projects. Students are expected to: i) attend all of the lecture and site visit sessions associated with this course; ii) actively participate in the design project developed by each team.

Program Assessment

1. Program & Team Participation (15%)

This component will assess the interest, participation and interaction of each student in the different phases of this study abroad course (lectures, project design of case studies, site visits).

Throughout the program, the faculty will assess through one to one interaction and discussions the following: student knowledge of the principles of developing green infrastructure design alternatives; their ability to recognize the complex and multi-disciplinary analysis required for such projects; their knowledge and ability to identify the set of qualitative and quantitative indicators for the design of “green infrastructure.”

Participants will be asked to select one of the technical /cultural site visits included in the program, prepare explanatory material and present their findings and explanation to the rest of the team during the actual visit.

2. Design Project Report & Presentation (70%)

Each student and team will be assessed based on the level of performance in regards to the following list of outcomes:

- participatory decision making within a team;
- ability to create and administer design alternatives based on community needs assessment, and cultural identity;
- ability to create and analyze multiple design alternatives;
- ability to determine appropriate techniques and methods to be used in solving societal needs mingled with engineering and environmental principles;
- ability to define evaluation metrics for the design project.

3. Reflection Summary (15%)

At the conclusion of the program a “Reflection” summary will be prepared from each student which will highlight:

- cultural immersion experience pinpointing both social & professional differences between US & GR;
- details and impressions from a technical /cultural site visit of choice.

Academic Integrity

Students will be reminded of the academic integrity expectations and the [Honor Code](#).