MIT’S MASTER OF SCIENCE IN TRANSPORTATION (MST) PROGRAM

REQUIREMENTS:
The requirements for the Master of Science in Transportation degree consist of the following:

(1) a core of two 12-unit subjects;
(2) a) an individually designed program area comprised of 3 subjects totaling at least 30 units.
   b) at least one Policy or Technology subject;
(3) a computer programming requirement;
(4) a thesis.

The degree requires a total of 66 graduate units exclusive of a thesis.

The Core
The MST core consists of two 12-unit subjects, which are taught in the Fall semester:

1.200 Transportation Systems Analysis: Performance and Optimization (C. Osorio)
Problem-motivated introduction to methods, models and tools for the analysis and design of transportation networks including their planning, operations and control. Capacity of critical elements of transportation networks. Traffic flows and deterministic and probabilistic delay models. Formulation of optimization models for planning and scheduling of freight, transit and airline systems, and their solution using software packages. User- and system-optimal traffic assignment. Control of traffic flows on highways, urban grids, and airspace.

1.201 Transportation Systems Analysis: Demand and Economics (M. Ben-Akiva)
Introduces transportation systems analysis, stressing demand and economic aspects. Covers the key principles governing transportation planning, investment, operations and maintenance. Introduces the microeconomic concepts central to transportation systems. Economic theories of the firm, the consumer and the market, disaggregate and aggregate demand models, discrete choice analysis, cost models and production functions for passenger and freight demand, pricing theory and application to transportation systems including the theory and practice of congestion pricing, technological change, resource allocation, market structure and regulation in the transportation industry, and project evaluation for transportation systems. Applications include passenger and freight, urban public transportation, aviation and intelligent transportation systems.
The core reflects the interdisciplinary, systems-oriented nature of our educational approach.

**The Program**

The program requires each student to select three or more subjects which further their educational objectives in the field of transportation. For some students this will mean building their depth of understanding in a selected area of interest. For other students the program may emphasize breadth rather than depth in a single area. At least two of the designated subjects should be clearly focused on transportation, while the other(s) can be in a field which supports transportation— for example, a subject covering methods that are used in transportation, drawn from fields such as economics, operations research, political science, management, project evaluation and others.

Depth is provided in the following areas:

- Air Transportation
- Analysis and Planning Methods
- Data Sciences for Transportation
- Intelligent Transportation Systems, Safety and Security
- Logistics and Supply Chain Management
- Transportation Policy, Planning and Sustainability
- Urban Transportation

Three subjects selected from any subset of the above areas will achieve breadth. At least one of the subjects should be either a Policy or a Technology course.

**The Computer Programming Requirement**

Graduates of the MST program are expected to have working knowledge of computer programming and information technology since this is a pre-requisite to function as a transportation professional. The Computer Programming requirement can be satisfied by taking a subject from the following list:

- 1.002 Introduction to Computers and Engineering Problem Solving (G credit, 12 units), John Williams
- 1.000 Computer Programming for Scientific and Engineering Applications (U credit, 12 units), Ruben Juanes
- 6.149 Introduction to Programming Using Python (U credit, 6 units, IAP)
- 6.0001 Introduction to Computer Science Programming in Python (U credit, 6 units), J. V. Guttag
Note that only 1.002 provides graduate credit. The other listed subjects may qualify for graduate credit, provided that the student obtains permission from the TEC executive director and the Dean for Graduate Education. To seek graduate credit, students must coordinate with their academic advisor and subject’s instructor regarding what extra work is required; then, they must complete the petition form, http://odge.mit.edu/wp-content/uploads/2011/09/Petition_Form.pdf.

Furthermore, students may petition for a waiver of this requirement based on previous coursework. Students should submit a waiver request as early as possible, when they fill out the program approval form (http://cee.mit.edu/system/files/MST_Prog_Appr_Form.pdf).

The waiver request must include the course description and transcript grade. Please note that an approved waiver of the Computer Programming requirement does not reduce the overall number of credits to be taken (students with approved waivers will still need to fulfill the 66 credits requirement). Waiver requests should be submitted to tec@mit.edu.

**Subject Areas**

**Policy subjects**

There are three types of subjects that relate to policy:

I. **Transportation policy subjects:**

- 1.252J/11.540J/ESD Urban Transportation Planning (Salvucci, Murga)
- 1.253J/11.543J/ESD222J Transportation Policy, the Environment, and Livable Communities (Coughlin, Salvucci)
- 11.478 Behavior and Policy: Connections in Transportation (Zhao)
- 11.S956 Mobility Management in China: Transportation Research Seminar (Zhao)
- HUT 251 (Gomez-Ibáñez’s subject at Harvard’s Kennedy School)

II. **Transportation subjects with substantial policy content (nominally half):**

- 11.526 Comparative Land-Use and Transportation Planning (Zegras)
- 16.71 The Airline Industry (Belobaba, et al)
III. Policy subjects with modest or no transportation content:

ESD.10 Introduction to Technology and Policy (Field, Marks)
ESD.103/17.310/STS.482 Science, Technology and Public Policy (McCray, Oye)
ESD.128J/12.848/15.023 Global Climate Change: Economics, Science and Policy (Paltsey, Prinn, Reilly, Schlosser, Selin, Strzepek, Webster)
ESD.132/15.655 Law, Technology and Public Policy (Ashford, Caldart, Meldman)
6.805J Foundations of Information Policy (Abelson, Fischer, Weitzner)
11.255 Negotiations and Dispute Resolution In the Public Sector (Susskind)
11.481/1.284/ESD192 Analyzing and Accounting for Regional Economic Change
11.482/1.285/ESD.193 Regional Socioeconomic Impact Analyses and Modeling (Polenske)

Technology subjects

Subjects that satisfy the program technology requirement include:

2.65J Sustainable Energy (Golay)
6.268 Network Science and Models (Jaillet, Tsitsiklis)
16.422J Human Supervisory Control of Automated Systems (Shah)
16.453J Human Factors Engineering (Stirling)
16.72 Air Traffic Control (Balakrishnan)
MAS.552J City Science (Chin, Larson)
MAS.836 Sensor Technologies for Interactive Environments (DiFrancesco, Gershenfeld)

Students must complete a research-based Master's thesis on a topic of their choice, approved by their thesis supervisor.

Except for the core subjects and the thesis, the following lists present suggested options that fulfill the requirements. Students can propose other subjects, which would require approval of the Transportation Education Committee.

TRANSPORTATION SUBJECTS – LISTED BY AREA

SUBJECT # TITLE (JOINT SUBJECT NUMBERS)

Air Transportation:
16.71J (P) The Airline Industry (1.232,15.054,ESD.217)
16.72 (T) Air Traffic Control
16.75J Airline Management (1.234)
16.763J Air Transportation Operations Research (1.233J)
16.781J Planning and Design of Airport Systems (1.231, ESD.224)
16.886J Air Transportation Systems Architecting

Analysis and Planning Methods:
1.202J Demand Modeling (ESD.212)
1.203J Logistical & Transportation Planning Methods (6.281, 15.073, 16.76, ESD.216)
1.205J Advanced Demand Modeling (ESD.213)

Data Sciences for Transportation:
1.204 Computer Modeling: From Human Mobility to Transportation Networks
6.268 (T) Network Science and Models
11.205 Introduction to Spatial Analysis
15.060 Data, Models, and Decisions
15.077J Statistical Learning and Data Mining
15.082 Network Optimization (6.855, ESD.78)

Intelligent Transportation Systems, Safety and Security:
1.208 Resilient Infrastructure Networks
6.805J Foundations of Information Policy
16.413 (T) Principles of Autonomy and Decision Making
16.422J (T) Human Supervisory Control of Automated Systems
ESD.863J System Safety Concepts
16.413 (T) Principles of Autonomy and Decision Making
16.412 (T) Cognitive Robotics

Logistics and Supply Chain Management:
1.203J Logistical & Transportation Planning Methods (6.281, 15.073, 16.76, ESD.216)
1.260J Logistics Systems (15.770, ESD.260)
1.261J Case Studies in Logistics and Supply Chain Management (15.771, ESD.261)
1.265J International Supply Chain Management (2.965J, 15.765, ESD.265)
1.270J Logistics and Supply Chain Management (ESD.273)
ESD.266 Freight Transportation

Transportation Planning, Policy and Sustainability:
1.253J (P) Transportation Policy and Environmental Limits (11.543, ESD.222)
1.817 Planning, Participation and Consensus Building for Sustainable Development
2.65J (T) Sustainable Energy
11.478 (P)  Behavior and Policy: Connections in Transportation
11.527  Advanced Seminar in Transportation Finance
ESD.132J (P)  Law, Technology, and Public Policy (15.655)
ESD.133J (P)  Environmental Law, Policy, and Economics: Pollution Prevention and Control (1.811, 11.630)
HUT 251 (P)  Transportation Policy and Planning (Kennedy School of Government, Harvard)

**Urban Transportation:**

1.251J (P)  Comparative Land Use and Transportation Planning (11.526J)
1.252J (P)  Urban Transportation Planning (11.540, ESD.225)
1.254  Transport Modeling Course
1.258J  Public Transportation Systems (11.541, ESD.226)
11.S956 (P)  Mobility Management in China: Transportation Research Seminar

(T) – Indicates subject satisfies Technology requirement
(P) – Indicates subject satisfies Policy requirement