

MSc Degree Program in Transport and Logistics

Study Guide

2015-16

Study Guide



DTU Transport

MSc Degree Program in
Transport and Logistics

Study Guide

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How to Read the Study Guide

This booklet introduces proposals for study plans for the DTU MSc Program in Transport and Logistics. This only serves the purpose for inspiration, thus, please be aware of the fact that it is your own responsibility to draw up your own study plan – if you should have any questions please do not hesitate to contact me further for advice. Moreover, you can consult both the website for the program at:

http://www.dtu.dk/english/Education/msc/Programmes/transport_and_logistics or for further practicalities and rules for the MSc programme: www.sdb.dtu.dk.

Structure and contents

The MSc program in Transport and Logistics follows the general rules for Graduate programs at the Technical University of Denmark (DTU) – where the structure in brief can be describe through the so-called *Flag-Model*:

MSc program – 120 ECTS points	
General Degree Competences (min. 30 points)	Technological Specialisation (min. 30 points)
Elective Courses (max. 30 points)	Thesis (30 / 32.5 / 35 points)

The Flag-Model is comprised of four boxes, i.e. General Degree Competences (GR), Technological Specialisation (TS), Elective courses (EC) and a final thesis.

General competences courses [GR] (minimum 30 ECTS points)

As an engineer, whether you work as a professional or within research and development, you need a number of general competences in order to comply with the requirements of a modern engineering job. This group of courses teaches you:

- General engineering competences - You learn how to combine technology application and development with finances, management and organisation and most important you learn how to use your qualifications and technological know-how in a professional and social context.
- Synthesis competences - You learn how to define and provide solutions to an open problem. You may be part of a cross-disciplinary team and you are trained in communication and collaboration.
- Normative competences - Here you are taught a set of essential disciplines that are common to all technical aspects of engineering within a specific field.

Please ensure that you within the 2 years of graduate studies comply with a set of GR courses equivalent to a minimum of 30 ECTS points. Please be advised that you obviously are allowed to follow more than 30 credits.

Technological specialisation courses [TS] (minimum 30 ECTS points)

This group of courses gives you the in-depth academic and technological knowledge necessary for obtaining state-of-the-art competences within the specific field of engineering. The course profile depends on the recommended study line or specialization that you have decided to follow. This specific booklet details four various study lines – where you can decide to follow one particular study line or you can choose to select courses from all study lines. Please be advised that if you want to have a study line profile on your final diploma, you **NEED** to follow the recommended courses suggested in this the booklet and online. It is not required that you follow a specific study line.

Evidently you must follow at least 30 ECTS points, however, as for the GR you are allowed to have more than 30 credits.

Elective courses [E] (maximum 30 ECTS points)

An important part of the DTU MSc programs is the significant amount of elective courses. Here you can pursue your own scientific and professional interests. In principle you can choose between more than 400 different DTU courses. Please note that both General Competence and Technological specialisation courses are eligible to choose as elective courses.

Please be advised that you can only have a maximum of 30 credits within this block.

MSc thesis (minimum 30 ECTS points)

The MSc thesis marks the completion of the two-year MSc program. The research project is most often carried out at DTU and in many cases in collaboration with one of our many industrial partners. All projects include elements of fundamental research, innovation and application and the workload should be either 30, 32.5 or 35 ECTS. Please be advised that you are recommended to start up both the search for a topic and supervisor minimum 6 month in advance. There will be held a mandatory luncheon on thesis topics and practicalities once every year ultimo October after the fall break.

Finally, there are four dates for a thesis start-up: for the fall semester starters it is the first working day in January OR the first Monday directly after the 3-weeks period (in January) and for the spring semester starters it is the first Monday in August OR the first Monday immediately after the 3-weeks period (in August).

Structure of the study plans

We present study plans for the four study lines in:

- Transport and Business Logistics (TBL)
- Traffic Planning and Traffic Engineering (TPTE)
- Modelling of Traffic and Transport (MTT)
- Railway Technology (RT)

Each study line is described through a short introduction as concerns content and profile. Hereafter is a list of all technological specialisation courses relevant for the particular study line shown. Please note that students not seeking for a specific line of study are entitled to freely select among all technological specialisation courses provided in this booklet. Subsequently, a schematic overview of courses for each study line is depicted and finally an exemplar of a schedule is provided.

The courses which are shown in **bold** (blue [GR] and green [TS]) are the courses proposed for each semester. Alternative courses (red [E]) are listed for the convenience of the reader. Subsequent to the course number a letter code is given. The legend for these letter codes is:

- (GR) – the course counts as a General Degree Competence course

- (TS) – the course counts as a Technological Specialisation course
- (E) – the course is not a (GR) or (TS) course and therefore falls in the Elective course category

For students accepted by DTU for the September 2015 intake (and onwards) the following general degree competence courses are mandatory:

13301	Transport, economics, management, planning, organization and Policy	5	Point
42401	Introduction to Planning	5	Point

Additionally, students accepted by DTU for the September 2015 intake can choose between the following general degree competence courses (minimum 20 ECTS points):

13133	Introduction to Transport Models	5	point
13150	Transport Economics	5	point
13240	Railway Operations and Management	5	point
13251	Optimisation in Public Transport	5	point
13233	Decision Support and Risk Analysis	5	point
13400	Simulation in Freight Transportation and Logistics	5	point
42115	Network Optimization	5	point

For students accepted prior to September 2015 please consult either the program coordinator or the study handbook at www.sdb.dtu.dk for further advice.

Additionally a long list of technological specialisation courses is provided below. Specifically, students within the MSc program of Transport and Logistics can freely select among all 26 courses (equivalent to 150 ECTS point). However, be advised, that if you want to finalise your study with a study line profile on your diploma you need to select at least 30 ECTS credit points within the specific study line:

02409	Multivariate Statistics	E1A	5 ECTS
02424	Advanced Data Analysis and Statistical Modelling	F2A	5 ECTS
02431	Risk Management	JAN	5 ECTS
02443	Stochastic Simulation	JUN	5 ECTS
13126	Railway Design and Maintenance	F5	10 ECTS
13129	Rolling Stock acquisition and Management	JUN	5 ECTS
13134	Advanced Transport Models	F4B	5 ECTS
13135	Discrete Choice Models	E5B	5 ECTS
13141	Route Choice Models	E4B	5 ECTS
13160	Road Safety Analysis and Modelling	E2A	5 ECTS
13236	Sustainable Transport Assessment	E1A	5 ECTS
13351	Research Immersion, DTU Transport ¹	JUL	5 ECTS
13352	Research Immersion, DTU Transport ¹	AUG	5 ECTS
13410	Programming in Transport Optimization	JAN	5 ECTS
13420	Green Transport Logistics	F5B	5 ECTS
13432	Maritime Logistics	F4B	5 ECTS

¹ The two Research Immersion courses are possibly accountable as technological specialisation, it however needs acceptance from the program coordinator if so, otherwise, it will be valid as an elective course.

13437	Optimering af operationelle transportsystemer	E1B	5 ECTS
13442	Vehicle Routing and Distribution Planning	E1B	5 ECTS
13450	Intelligent Transportation Systems (ITS) – modelling and analysis	JUN	5 ECTS
34345	Signalling systems and Technology for Railways	E3A	5 ECTS
42114	Integer Programming	E4A	5 ECTS
42136	Large Scale Optimization using Decomposition	F2B	5 ECTS
42137	Optimization using Metaheuristics	F2A	5 ECTS
42172	Risk and decision-making	JAN	5 ECTS
42273	Urban Planning and Sustainable Development	F2	10 ECTS
42280	Smart, Connected and Livable Cities	E4A	5 ECTS
42371	Design in LEAN Production and Service Systems	F1	10 ECTS
42372	Life Cycle Assessment of Products and Systems	E1	10 ECTS
42413	Simulation in Production and Services	JUN	5 ECTS
42457	Supply Chain Management	E3A	5 ECTS
42459	Planning and Scheduling in Manufacturing and Services	F3A	5 ECTS

PLEASE NOTE! The proposed study plans presented here are based on the best-of-knowledge. The list of courses included is NOT completely exhaustive. This means that there may be courses that are relevant for the individual student which is not listed in the study plans.

Overview of GR and TS courses

The following two diagrams depict the courses placed in a modular form with regard to the DTU course modules. Please be advised, as courses from the departments offering courses to this program may shift time slots (modules) it is the module listed on the DTU course website that counts: www.courses.dtu.dk.

Flexible study year and study progress

It is a great pleasure to introduce the new flexible study year specifically with the introduction of two new three-week periods respectively in July and August. Currently, all programs at DTU have introduced various courses in those periods, you are therefore strongly encouraged to browse the course database to seek out interesting courses around Campus. This program offers two courses in respectively July and August in terms of 13351 and 13352 Research Immersion, which are suggested to be taken in the final part of your study. As part of the new study progress report, you are forced to register 60 new ECTS credits every year – thus it is important now more than ever to prepare a valid and strong study plan. REMEMBER that after the re-registration period ends (normally one month after semester start) you are automatically assigned the final exam – which cannot be de-selected. Moreover, if you fail or do not show up you will also be automatically assigned the re-examination, thus a wrong course selection can cost you up to two examination trials for a course.

Further information

Questions and comments should be directed to program coordinator Associate Professor Kim Bang Salling (kbs@transport.dtu.dk).

Web-site

The program web-site is located at: www.transportation.dk

Study Line: Transport and Business Logistics (TBL)

Transport and Business Logistics (TBL) is aimed at optimizing transportation, flows of goods and logistics. At the end of this proposed study line the student will be able to perform amongst other:

- Planning of company distribution systems, including supply chains and flow of goods
- Planning and optimisation of public transportation systems
- Planning and optimisation of production and internal transportation in a firm
- Planning of the location of company units, i.e. service units, transport terminals and production units
- Planning of capacity needs and the use of capacity in transportation systems (e.g. planning of means of transportation for persons and freight).

The TBL study line is constructed through the following master list from which the 90 respectively GR: General Degree Competences, TS: Technological Specialisation and E: Elective course points must be selected.

For the TBL Study Line it is mandatory to complete the following set of technological specialisation courses accounting for 15 ECTS points:

13432	Maritime Logistics	F4B	5 ECTS
13442	Vehicle Routing and Distribution Planning	E1B	5 ECTS
42114	Integer Programming	E4A	5 ECTS

Furthermore, candidates can freely choose from the remaining courses (Min. 15 ECTS points) accounting for 30 ECTS points:

13410	Programming in Transport Optimization	JAN	5 ECTS
13420	Green Transport Logistics	F5B	5 ECTS
42136	Large Scale Optimization using Decomposition	F2B	5 ECTS
42137	Optimization using Metaheuristics	F2A	5 ECTS
42371	Design in LEAN Production and Service Systems	F1	10 ECTS
42457	Supply Chain Management	E3A	5 ECTS
42459	Planning and Scheduling in Manufacturing and Services	F3A	5 ECTS

The courses above constitute technological specialisation courses appropriate for the study line Transport and Business Logistics, i.e. if students choose 30 ECTS points from the latter they are entitled to achieve this line of study on their degree. Please note, that students not seeking for a special line of study still are free to select courses from this list.

The following schematic overview depicts course modules within the DTU standard separated respectively in a Fall, January, Spring and June term. Be advised, the elective course category are only guideline courses found appropriate for this study line, thus, students can freely select courses around Campus.

Aggregate:		General Degree	40
		Technological Specialisation	55
		Elective Courses	55

TBL: Transport and Business Logistics					
Fall	Monday	Tuesday	Wednesday	Thursday	Friday
Morning	E1A	E3A	E5A	E2B	E4B
	02409	42457	13301	13106	02417
	42171			13233	42115
	42376				
Lunch					
Afternoon	E2A	E4A	E5B	E1B	E3B
	42435	42114	13133	42401	
	13106	42123		13442	
3-Weeks Course January					
	42112	13410			
Spring	Monday	Tuesday	Wednesday	Thursday	Friday
Morning	F1A	F3A	F5A	F2B	F4B
	13150			42136	13432
	42371	42459		02417	
Lunch					
Afternoon	F2A	F4A	F5B	F1B	F3B
	42137	13400	13420	13251	
	42435			42371	
3-Weeks Course June/July/August					
	02443	13351	13352		

The list of suggested elective courses is constituted below:

02409	Multivariate Statistics	E1A	5 ECTS
02417	Time Series Analysis	E4B/F2B	5 ECTS
02443	Stochastic Simulation	JUN	5 ECTS
13106	GIS and Road Traffic Planning for MSc students	E2	10 ECTS
42112	Mathematical Programming with Modelling Software	JAN	5 ECTS
42123	Optimization in Finance	E4A	5 ECTS
42171	System safety and Reliability Engineering	E1A	5 ECTS
42376	Operations Management in Health care and service systems	E1A	5 ECTS
42435	Knowledge based Entrepreneurship	E2A/F2A	5 ECTS

The following presents a proposal in order to obtain a Masters degree within the study line of Transport and Business Logistics. Please note that blue colour coding refers to courses suggested to be followed whereas red codes refer to possible courses to be selected. The full list of courses is available at the end of this booklet.

Transport and Business Logistics: Example of Schedule

The following schedule assumes that students either fully comply with the given prerequisites for enrolment within the program or at minimum follows the conditional requirements for supplementary courses within the first semester.

Fall '15	Monday	Tuesday	Wednesday	Thursday	Friday	1. Semester
	E1A	E3A	E5A	E2B	E4B	
Morning 08-12	02409 42171	42457	13301	13106	42115	
Lunch						
	E2A	E4A	E5B	E1B	E3B	
Afternoon 13-17	13106	42114	13133	42401		
3-Weeks Course January 2013						
13410 42112						
Spring '16	Monday	Tuesday	Wednesday	Thursday	Friday	2. Semester
	F1A	F3A	F5A	F2B	F4B	
Morning 08-12	42371 13150	42459		42136 02417	13432	
Lunch						
	F2A	F4A	F5B	F1B	F3B	
Afternoon 13-17	42137	13400	13420	42371 13251		
3-Weeks Course June 2013						
	02443					
Fall '16	Monday	Tuesday	Wednesday	Thursday	Friday	3. Semester
	E1A	E3A	E5A	E2B	E4B	
Morning 08-12	42376 02409 42171	42457		13233	02417	
Lunch						
	E2A	E4A	E5B	E1B	E3B	
Afternoon 13-17	42435			13442 42401		
3-Weeks Course January 2014						
	42112					
Master thesis subject requirement of 30 ECTS points						

The example presented has been generated with an amount of 30 (GR) and 40 (TS) – with a Master thesis subject for 30 ECTS point (20 elective course points are necessary before completion)

Study Line: Traffic Planning and Traffic Engineering (TPTE)

Traffic planning creates the foundation for decisions about construction of new infrastructure or large-scale investments in public transportation. It also forms a basic ingredient in controlling public transportation, freight transport and the network of roads. At the end of this proposed study line the student will be able to perform amongst other:

- Valuation of the needs to base decisions within traffic politics and analyses
- Specification of models together with application and valuation of model calculations
- Analysis based on traffic engineering and capability to relate the results to model calculations
- Cost-Benefit valuation of projects together with a projection and evaluation of traffic infrastructure
- Description of the foundation for decision-making, both in a technical and communicative way

The TPTE study line is constructed through the following master list from which the 90 respectively GR: General Degree Competences, TS: Technological Specialisation and E: Elective course points.

For the TPTE Study Line is mandatory as part of the General Degree Competences to follow:

13150	Transport Economics	F1A	5 ECTS
13233	Decision Support and Risk Analysis	E2B	5 ECTS

Moreover, to complete the following technological specialisation course accounting for 5 ECTS points:

13236	Sustainable Transport Assessment	E1A	5 ECTS
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Furthermore, candidates can freely choose from the remaining courses (Min. 20 ECTS points) accounting for 30 ECTS points:

02431	Risk Management	JAN	5 ECTS
02443	Stochastic Simulation	JUN	5 ECTS
42171	Systems safety and Reliability Engineering	E1A	5 ECTS
42172	Risk and Decision-making	JAN	5 ECTS
42273	Urban Planning and Sustainable Development	F2	10 ECTS
42280	Smart, Connected and Livable Cities	E4A	5 ECTS
42372	Life Cycle Assessment of Products and Systems	E1	10 ECTS
42413	Simulation in Production and Services	JUN	5 ECTS

The courses above constitute technological specialisation courses appropriate for the study line Transport Planning and Traffic Engineering, i.e. if students choose 30 ECTS points from the latter they are entitled to achieve this line of study on their degree. Please note, that students not seeking for a special line of study still are free to select courses from this list.

The following schematic overview depicts course modules within the DTU standard separated respectively in a Fall, January, Spring and June term. Be advised, the elective course category are only guideline courses found appropriate for this study line, thus, students can freely select courses around Campus.

Aggregate:		General Degree	40
		Technological Specialisation	55
		Elective Courses	50

TPTE: Traffic Planning and Traffic Engineering					
Fall	Monday	Tuesday	Wednesday	Thursday	Friday
	E1A	E3A	E5A	E2B	E4B
Morning	13236		13301	13106	42115
08-12	42372			13233	
	42171				
Lunch					
	E2A	E4A	E5B	E1B	E3B
Afternoon	13106	42280	13133	42401	
13-17	13160	42114	13135	42372	
3-Weeks Course January					
	42112	02431	13011	42172	
Spring	Monday	Tuesday	Wednesday	Thursday	Friday
	F1A	F3A	F5A	F2B	F4B
Morning	13150	42273		02417	
08-12				42273	
Lunch					
	F2A	F4A	F5B	F1B	F3B
Afternoon	02424	13135	13420	13251	42273
13-17		13400			
		42280			
3-Weeks Course June/July/August					
	13450	02443	13351	13352	42413

The list of suggested elective courses is constituted below:

02424	Advanced Data analysis and Statistical Modelling	F2A	5 ECTS
13011	Geometric Highway Design (BSc) (note: DK w. UK slides)	JAN	5 ECTS
13106	GIS and Road Traffic Planning for MSc Students	E2	10 ECTS
13135	Discrete Choice Models	E5B	5 ECTS
13160	Road Safety	E2A	5 ECTS
13251	Optimisation in Public Transport	F1B	5 ECTS
13420	Green Transport Logistics	F5B	5 ECTS
13450	Intelligent Transport systems (ITS) – Modelling and Analysis	JUN	5 ECTS
42112	Mathematical Programming with modelling software	JAN	5 ECTS
42114	Integer Programming	E4A	5 ECTS

The following will present a proposal in order to obtain a Masters degree within the study line of Traffic Planning and Traffic Engineering. Please note that blue colour coding refers to courses suggested to be followed whereas red codes refer to possible courses to be selected. The full list of courses is available at the end of this booklet.

Traffic Planning and Traffic Engineering: Example of Schedule

The following schedule assumes that students either fully comply with the given prerequisites for enrolment within the program or at minimum follows the conditional requirements for supplementary courses within the first semester.

Fall '15	Monday	Tuesday	Wednesday	Thursday	Friday	1. Semester
	E1A	E3A	E5A	E2B	E4B	
Morning 08-12	13236		13301	13106	42115	
Lunch						
	E2A	E4A	E5B	E1B	E3B	
Afternoon 13-17	13106	42280	13133	42401		
3-Weeks Course January 2014						
	13011	02431	42112	42172		
Spring '16	Monday	Tuesday	Wednesday	Thursday	Friday	2. Semester
	F1A	F3A	F5A	F2B	F4B	
Morning 08-12	13150		13126	02417	13134	
Lunch						
	F2A	F4A	F5B	F1B	F3B	
Afternoon 13-17	02424	13135 13400	13126	13251		
3-Weeks Course June 2014						
	13450	02443				
Fall '16	Monday	Tuesday	Wednesday	Thursday	Friday	3. Semester
	E1A	E3A	E5A	E2B	E4B	
Morning 08-12	42171 13236			13233		
Lunch						
	E2A	E4A	E5B	E1B	E3B	
Afternoon 13-17		42457 42280	13133 13135	42401		
3-Weeks Course January 2015						
	02431	42172				
Master thesis subject requirement of 30 ECTS points						

The example presented has been generated with an amount of 35 (GR) and 40 (TS) – with a Master thesis subject for 30 ECTS point (20 elective course points are necessary before completion)

Study Line: Modelling of Traffic and Transport (MTT)

Traffic and transportation models are computer based mathematical models used to determine the consequences of new infrastructure or effects of politics. At the end of this proposed study line the student will be able to perform amongst other:

- Construction of new models and maintenance of existing ones
- Demand specification for models and evaluation of the results
- Using models to plan transportation systems (public traffic, road traffic, freight traffic, etc.)
- Communication of results based on models towards customers and decision-makers
- Contribute in teams doing large-scale planning projects

The MTT study line is constructed through the following master list from which the 90 respectively GR: General Degree Competences, TS: Technological Specialisation and E: Elective course points.

For the MTT Study Line is mandatory to complete the following set of technological specialisation courses accounting for 15 ECTS points:

13134	Advanced Transport Models	F4B	5 ECTS
13135	Discrete Choice Models	E5B	5 ECTS
13141	Route Choice Models	E4B	5 ECTS

Furthermore, candidates can freely choose from the remaining courses (Min. 15 ECTS points) accounting for 30 ECTS points:

02409	Multivariate Statistics	E1A	5 ECTS
02424	Advanced Data Analysis and Statistical Modelling	F2A	5 ECTS
02443	Stochastic Simulation	JUN	5 ECTS
13160	Road Safety	E2A	5 ECTS
13410	Programming and Transport Optimisation	JAN	5 ECTS
13450	Intelligent Transportation Systems (ITS) – modelling and analysis	JUN	5 ECTS
42114	Integer Programming	E4A	5 ECTS

The courses above constitute technological specialisation courses appropriate for the study line Modelling of Traffic and Transport, i.e. if students choose 30 ECTS points from the latter they are entitled to achieve this line of study on their degree. Please note, that students not seeking for a special line of study still are free to select courses from this list.

The following schematic overview depicts course modules within the DTU standard separated respectively in a Fall, January, Spring and June term. Be advised, the elective course category are only guideline courses found appropriate for this study line, thus, students can freely select courses around Campus.

Aggregate:		General Degree	45
		Technological Specialisation	50
		Elective Courses	55

MTT: Modelling of Traffic and Transport					
Fall	Monday	Tuesday	Wednesday	Thursday	Friday
	E1A	E3A	E5A	E2B	E4B
Morning 08-12	13236		13301	13106	13141
	02409			13233	02417
					42115
Lunch					
	E2A	E4A	E5B	E1B	E3B
Afternoon 13-17	13106	13240	13133	42401	
	13160	42114	13135	13442	
3-Weeks Course January					
	13410	02431	42112		
Spring	Monday	Tuesday	Wednesday	Thursday	Friday
	F1A	F3A	F5A	F2B	F4B
Morning 08-12	13150			02417	13134
					13432
Lunch					
	F2A	F4A	F5B	F1B	F3B
Afternoon 13-17	02424	13400	13420	13251	
3-Weeks Course June/July/August					
	13450	02443	13351	13352	

The list of suggested elective courses is constituted below:

02417	Time Series Analysis	E4B/F2B	5 ECTS
02431	Risk Management	JAN	5 ECTS
13106	GIS and Road Traffic Planning for MSc Students	E2	10 ECTS
13236	Sustainable Transport Assessment	E1A	5 ECTS
13410	Programming and Transport Optimisation	JAN	5 ECTS
13420	Green Transport Logistics	F5B	5 ECTS
13432	Maritime Logistics	F4B	5 ECTS
13442	Vehicle Routing and Distribution Planning	E1B	5 ECTS
42112	Mathematical Programming with Modelling Software	JAN	5 ECTS
42457	Supply Chain Management	E3A	5 ECTS

The following present a proposal in order to obtain a Masters degree within the study line Modelling of Traffic and Transport. Please note that blue colour coding refers to courses suggested to be followed whereas red codes refer to possible courses to be selected. The full list of courses is available at the end of this booklet.

Modelling of Traffic and Transport: Example of Schedule

The following schedule assumes that students either fully comply with the given prerequisites for enrolment within the program or at minimum follows the conditional requirements for supplementary courses within the first semester.

Fall '15	Monday	Tuesday	Wednesday	Thursday	Friday	1. Semester
	E1A	E3A	E5A	E2B	E4B	
Morning 08-12	13236 02409		13301	13106	42115 13141	
Lunch						
	E2A	E4A	E5B	E1B	E3B	
Afternoon 13-17	13106	42114 13240	13133	42401		
3-Weeks Course January						
	13410	13011	42112	02431		
Spring '16	Monday	Tuesday	Wednesday	Thursday	Friday	2. Semester
	F1A	F3A	F5A	F2B	F4B	
Morning 08-12	13150			02417	13134 13432	
Lunch						
	F2A	F4A	F5B	F1B	F3B	
Afternoon 13-17	02424	13400	13420	13251		
3-Weeks Course June						
	13450	02443				
Fall '16	Monday	Tuesday	Wednesday	Thursday	Friday	3. Semester
	E1A	E3A	E5A	E2B	E4B	
Morning 08-12	02409 13236	42457		13233	13141 42115 02417	
Lunch						
	E2A	E4A	E5B	E1B	E3B	
Afternoon 13-17		42114	13135	13442 42401		
3-Weeks Course January						
	02431	42112	13410			
Master thesis subject requirement of 30 ECTS points						

The example presented has been generated with an amount of 35 (GR) and 45 (TS) – with a Master thesis subject for 30 ECTS point (20 elective course points are necessary before completion)

Study Line: Railway Technology (RT)

The railway is an important part of the infrastructure. Railways can transport many passengers and large amount of freight efficiently and safe. To operate and develop an efficient and well-functioning railway many aspects have to work together. At the end of this proposed study line the student will be able to perform amongst other:

- Plan and evaluate a real rail project
- Description of the foundation for decision-making, both in a technical and communicative way
- Design of railway infrastructure and evaluation of railway capacity
- Plan operation and maintenance of railways
- Evaluate life cycle costs for railways and safety issues on railways

The RT study line is constructed through the following master list from which the 90 respectively GR: General Degree Competences, TS: Technological Specialisation and E: Elective course points.

For the RT Study Line is mandatory to complete the following set of technological specialisation courses accounting for 20 ECTS points:

13126	Railway Design and Maintenance	F5	10 ECTS
13129	Rolling Stock acquisition and Management	JUN	5 ECTS
34345	Signalling Systems and Technology for Railways	E3A	5 ECTS

Furthermore, candidates can freely choose from the remaining courses (Min 10 ECTS points) accounting for 30 ECTS points:

02431	Risk Management	JAN	5 ECTS
42372	Life Cycle Assessment of Products and Systems	E1	10 ECTS

The courses above constitute technological specialisation courses appropriate for the study line Railway Technology, i.e. if students choose 30 ECTS points from the latter they are entitled to achieve this line of study on their degree. Please note, that students not seeking for a special line of study still are free to select courses from this list.

The following schematic overview depicts course modules within the DTU standard separated respectively in a Fall, January, Spring and June term. Be advised, the elective course category are only guideline courses found appropriate for this study line, thus, students can freely select courses around Campus.

Aggregate:		General Degree	45
		Technological Specialisation	35
		Elective Courses	60

RT: Railway Technology					
Fall	Monday	Tuesday	Wednesday	Thursday	Friday
	E1A	E3A	E5A	E2B	E4B
Morning	13236	34345	13301	13106	13141
08-12	42372			13233	42115
Lunch					
	E2A	E4A	E5B	E1B	E3B
Afternoon	13106	13240	13133	42372	
13-17			13135	13442	
				42401	
3-Weeks Course January					
	13011	02431	42112	42286	
Spring	Monday	Tuesday	Wednesday	Thursday	Friday
	F1A	F3A	F5A	F2B	F4B
Morning	13150		13126		13134
08-12					
Lunch					
	F2A	F4A	F5B	F1B	F3B
Afternoon		13400	13126	13251	
13-17					
3-Weeks Course June/July/August					
	13129	13450	02443	42286	
	13351	13352			

The list of suggested elective courses is constituted below:

02443	Stochastic Simulation	JUN	5 ECTS
13011	Geometric Highway Design (BSc) (note: DK w. UK slides)	JAN	5 ECTS
13106	GIS and Road Traffic Planning for MSc Students	E2	10 ECTS
13134	Advanced Transport Models	F4B	5 ECTS
13135	Discrete Choice Models	E5B	5 ECTS
13141	Route Choice Models	E4B	5 ECTS
13236	Sustainable Transport Assessment	E1A	5 ECTS
13442	Vehicle Routing and Distribution Planning	E1B	5 ECTS
13450	Intelligent Transport Systems (ITS) – Modelling and Analysis	JUN	5 ECTS
42112	Mathematical Programming with Modelling Software	JAN	5 ECTS
42286	Planning and Management in Construction	JAN/JUN	5 ECTS
42543	Management of Change in Engineering Systems	F4A	5 ECTS

The following present a proposal in order to obtain a Masters degree within the study line of Railway Technology. Please note that blue colour coding refers to courses suggested to be followed whereas red codes refer to possible courses to be selected. The full list of courses is available at the end of this booklet.

Railway Technology: Example of Schedule

The following schedule assumes that students either fully comply with the given prerequisites for enrolment within the program or at minimum follows the conditional requirements for supplementary courses within the first semester.

Fall '15	Monday	Tuesday	Wednesday	Thursday	Friday	1. Semester
	E1A	E3A	E5A	E2B	E4B	
Morning 08-12	13236 42372	34345	13301	13106	42115	
Lunch						
	E2A	E4A	E5B	E1B	E3B	
Afternoon 13-17	13400 13106	13240		42401 42372		
3-Weeks Course January						
	13011	02431	42112	42286		
Spring '16	Monday	Tuesday	Wednesday	Thursday	Friday	2. Semester
	F1A	F3A	F5A	F2B	F4B	
Morning 08-12	13150		13126		13134	
Lunch						
	F2A	F4A	F5B	F1B	F3B	
Afternoon 13-17		13400 42543	13126	13251		
3-Weeks Course June						
	13129	13450	02443	42286		
Fall '16	Monday	Tuesday	Wednesday	Thursday	Friday	3. Semester
	E1A	E3A	E5A	E2B	E4B	
Morning 08-12	42372 13236	34345		13233	13141 42115	
Lunch						
	E2A	E4A	E5B	E1B	E3B	
Afternoon 13-17				42372 13442 42401		
3-Weeks Course January						
	02431	42112	42286			
Master thesis subject requirement of 30 ECTS points						

The example presented has been generated with an amount of 30 (GR) and 45 (TS) – with a Master thesis subject for 30 ECTS point (10 elective course points are necessary before completion)

List of MSc courses

Courses delivered by DTU Transport:

Courses	DTU Transport	Mod.	ECTS	Type				Remarks
				TBL	TPTE	MTT	RT	
13106	ArcGIS and Road Traffic Planning	E2	10	E	E	E	E	
13126	Railway Design and Maintenance	F5	10			E	T	
13129	Rolling Stock acquisition and management	JUN	5				T	Revised course – replaces 13127
13133	Introduction to Transport Models	E5B	5	G	G	G	G	New Schedule
13134	Advanced Transport Models	F4B	5	E	T	T	T	
13135	Discrete Choice Models	E5B	5	E	E	T	E	
13141	Route Choice Models	E4B	5		E	T	E	
13150	Transport Economics	F1A	5	G	G	G	G	
13233	Decision Support Simulation and Risk Analysis	E2B	5	G	G	G	G	
13236	Sustainable Transport Assessment	E1A	5		T	T	E	
13240	Railway Operations and Management	E4A	5	G	G	G	G	Replaces course 13125
13251	Optimisation in Public Transport	F1B	5	G	G	G	G	Replaces course 13250
13301	Transport, Economics, Management, Planning, Organisation and Policy (TEMPOP)	E5A	5	G	G	G	G	Mandatory course
13351	Research Immersion, DTU Transport	JUL	5	(T)	(T)	(T)	(T)	3-weeks course
13352	Research Immersion, DTU Transport	AUG	5	(T)	(T)	(T)	(T)	3-weeks course
13400	Simulation in Freight Transport and Logistics	F4A	5	G	G	G	G	
13410	Programming in Transport Optimisation	JAN	5	T		T		3-weeks Course
13420	Green Transport Logistics	F5B	5	T	E	E		New Schedule
13432	Maritime Logistics	F4B	5	T		E		
13442	Vehicle Routing and Distribution Planning	E1B	5	T	E	E	E	
13450	Intelligent Transportation Systems	JUN	5		E	T	E	3-weeks Course

Besides the set of bachelor courses:

13000	Basic Course in Traffic and Roads	B.Sc.
13006	ArcGIS and Road Traffic Planning	B.Sc.
13011	Geometric Highway Design	B.Sc.
13015	Road Traffic Simulation	B.Sc.
13120	Public Transport Planning	B.Sc.

Courses delivered by other Departments:

Courses	Other Departments	Mod.	ECTS	Type				Remarks
				TBL	TPTE	MTT	RT	
02409	Multivariate Statistics	E1A	5	E	E	T		
02424	Advanced Data Analysis and Statistical Modelling	F2A	5		E	T		
02431	Risk Management	JAN	5		T	E	T	3-weeks course
02443	Stochastic Simulation	JUN	5	E	T	T	E	3-weeks course
34345	Signalling Systems and Technology for Railways	E3A	5	E	E	E	T	Replaces 13123
42112	Mathematical Programming with Modeling Software	JAN	5	E	E	E	E	3-weeks course
42114	Integer Programming	E4A	5	T	E	T	E	
42115	Network Optimization	E4B	5	G	G	G	G	
42136	Large Scale Optimization using Decomposition	F2B	5	T				
42137	Optimization using Metaheuristics	F2A	5	T				
42171	System Safety and Reliability Engineering	E1A	5	E	T			
42172	Risk and Decision-Making	JAN	5		T			
42273	Urban Planning and Sustainable Urban Development	F2	10		T			New Course
42280	Smart, Connected and Livable Cities	E4A	5		T			New course – replaces 42278
42286	Planning and Management in Construction	JAN JUN	5				E	3-weeks course
42371	Design in Lean Production and Service Systems	F1	10	T				
42372	Life Cycle Assessment of Products and Systems	E1	10		T		T	
42401	Introduction to Planning	E1B	5	G	G	G	G	Mandatory
42413	Simulation in Production and Services	JUN	5	T		E		
42457	Supply Chain Management	E3A	5	T	E	E	E	
42459	Planning and Scheduling in Manufacturing and Services	F3A	5	T				

Overview of progression in the program with study lines:

Progression MSc in Transport and Logistik: Study Line Specific				
	Transport and Business Logistics	Traffic Planning and Traffic Engineering	Modelling of Traffic and Transport	Railway Technology
Fall 1. sem.	13301: Transport, Economics, Management, Planning, Organisation and Policy (TEMPOP) (E5A)			
	42401: Introdution to Planning (E1B)			
	<div>42115: Network Optimization (E4B)</div> <div>42114: Integer Programming (E4A)</div>	<div>13133: Introduction to Transport Models (E5B)</div> <div>13236: Sustainable Transport Assessment (E1A)</div>	<div>13133: Introduction to Transport Models (E5B)</div> <div>42115: Network Optimization (E4B)</div>	<div>13240: Railway Operations and Management (E4A)</div> <div>13133: Introduction to Transport Models (E5B)</div>
Spring 2. sem.	<div>13400: Simulation in Freight Transportation and Logistics (F4A)</div> <div>13251: Optimisation in Public Transport (F1B)</div> <div>13432: Maritim Logistics (F4B)</div>	<div>13150: Transport Economics (F1A)</div> <div>13251: Optimisation in Public Transport (F1B)</div>	<div>13150: Transport Economics (F1A)</div> <div>13134: Advanced Transport Models (F4B)</div> <div>13160: Traffic Safety (E2A)</div>	<div>13150: Transport Economics (F1A)</div> <div>13126: Railway Design and Maintenance (F5)</div> <div>13129: Rolling Stock acquisition and Management (JUN)</div>
Fall 3. sem.	<div>13437: Optimisation of Operational Transport Systems (E5B)</div> <div>13442: Vehicle Routing and Distribution Planning (E1B)</div>	<div>13233: Decision Support and Risk Analysis (E2B)</div> <div>42172: Risk and Decision-Making (JAN)</div>	<div>13233: Decision Support and Risk Analysis (E2B)</div> <div>13135: Discrete Choice Models (E5B)</div> <div>13141: Route Choice Models (E4B)</div>	<div>13233: Decision Support and Risk Analysis (E2B)</div> <div>34345: Signalling systems and technology (E3A)</div>

Suggested courses for study lines: General Degree Competences (GR)
 Mandatory courses for study lines: Technological Specialisation (TS)

DTU Transport performs research and provides education on traffic and transport planning. It advises the Danish Ministry of Transport on infrastructure, economic appraisals, transport policy and road safety and collects data on the transport habits of the population. DTU Transport collaborates with companies on such topics as logistics, public transport and intelligent transport systems.

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