

Master of Science in Transport and Logistics

Module Description

(Last updated: 21 November 2018)

Introduction

The Master of Science in Transport and Logistics offers three specialisations:

- Logistics
- Transportation
- Railway Engineering

A number of modules are compulsory, regardless of the chosen specialisation. These modules come under the groups of:

- Compulsory core modules for all specialisations
- Compulsory internship and master thesis for all specialisations

For each specialisation a number of modules are compulsory. The compulsory modules for each specialisation are divided into the following three groups:

- Compulsory Logistics core modules
- Compulsory Transportation core modules
- Compulsory Railway Engineering core modules

A set of elective modules are available for each of the three specialisations. Depending on the chosen specialisation, the student must choose a certain number of electives to accumulate a total of 120 ECTS credits. The elective modules are divided into the following three groups:

- Elective Logistics modules
- Elective Transportation modules
- Elective Railway Engineering modules

Module Overview

Compulsory core modules for all specialisations

Module name	ECTS Credits	Page
• <u>Statistical Methods for Transportation and Logistic Processes</u>	5	5
• <u>Traffic Impacts, Evaluation of Transport and Logistic Processes</u>	5	6
• <u>Basics of Traffic Flow and Traffic Control</u>	5	8
• <u>Transport and Urban Planning</u>	5	9
• <u>Highway Design</u>	5	11

Compulsory internship and master thesis for all specialisations

Module name	ECTS Credits	Page
• <u>Internship</u>	11	12
• <u>Master Thesis</u>	30	10

Compulsory Logistics core modules (Identical to Compulsory Transportation core modules)

Module name	ECTS Credits	Page
• <u>Introduction to Business Logistics</u>	5	13
• <u>Decision Support for Logistics Management</u>	5	15
• <u>Introduction to Supply Chain Management</u>	5	17
• <u>Cross-discipline Modules</u>	6	18
• <u>Soft Skills, Business & Technical English + Excursion</u>	8	19

Compulsory Transportation core modules (Identical to Compulsory Logistics core modules)

Module name	ECTS Credits	Page
• <u>Introduction to Business Logistics</u>	5	13
• <u>Decision Support for Logistics Management</u>	5	15
• <u>Introduction to Supply Chain Management</u>	5	17
• <u>Cross-discipline Modules</u>	6	18
• <u>Soft Skills, Business & Technical English + Excursion</u>	8	19

Compulsory Railway Engineering core modules

Module name	ECTS Credits	Page
• <u>Rail Transport and Rail Planning</u>	5	20
• <u>Trackworks I</u>	5	21
• <u>Trackworks II (Urban Rail Focus)</u>	5	22
• <u>Public Transport Planning</u>	5	23
• <u>Train Control and Signalling Systems</u>	5	24
• <u>Rolling Stock</u>	5	24
• <u>Traffic Operation and Control (ITS)</u>	5	25
• <u>Transportation Modelling and Simulation Tools</u>	5	26
• <u>Soft Skills, Cross Cutting Fundamentals and Methods</u>	3	27

Elective Logistics modules

(students must choose four of the Elective Logistics modules plus one of the Elective Transportation modules)

Module name	ECTS Credits	Page
• <u>Industrial Logistics</u>	5	27
• <u>Consumer Industry Supply Chain Management</u>	5	28
• <u>Logistics Service Provider (LSP) Management</u>	5	29
• <u>Health Care Logistics</u>	5	33
• <u>Green Supply Chain and Risk Management</u>	5	34
• <u>Design and Application of Material Handling Systems</u>	5	36

Elective Transportation modules

(students must choose four of the Elective Transportation modules plus one of the Elective Logistics modules)

Module name	ECTS Credits	Page
• <u>Traffic Operations and Control (ITS)</u>	5	25
• <u>Transportation Modelling and Simulation Tools</u>	5	26
• <u>Public Transport Planning</u>	5	23
• <u>Airport and Harbour Design</u>	5	38
• <u>Rail Transport and Rail Planning</u>	5	20
• <u>Urban Road Design</u>	5	40

Elective Railway Engineering modules

All Elective Railway Engineering modules are taught at TUM Munich Campus, Germany

(students must choose two to four of the Elective Railway Engineering modules to accumulate minimum 11 credits)

Module name	ECTS Credits	Page
• <u>Civil Engineering in Energy Technology</u>	5	<u>Link</u>
• <u>Energy Systems and Energy Economy</u>	5	<u>Link</u>
• <u>Power Transmission Systems</u>	5	<u>Link</u>
• <u>Principles of Project Management</u>	3	<u>Link</u>
• <u>Geo Information</u>	6	<u>Link</u>
• <u>Land Use and Transport (Strategies and Models)</u>	6	<u>Link</u>
• <u>Road Design</u>	3	<u>Link</u>
• <u>Computer Aided Traffic Engineering with Matlab</u>	3	<u>Link</u>
• <u>Urban Infrastructure Design</u>	3	<u>Link</u>
• <u>Discrete Choice Methods for Transportation System Analysis</u>	6	<u>Link</u>

Module Descriptions

Statistical Methods for Transportation and Logistic Processes

[\(back to module overview\)](#)

Keywords:

Probability and statistical concepts. Statistical inference: estimation, hypothesis testing. Goodness-of-fit tests. Non-parametric procedures. Sampling methods. Regression analysis. Time series analysis. Computer applications.

Objective:

Introduction into transportation science which involves analysis of empirical data and applying the most common methods in statistics used to analyse the data in practical applications.

Contents:

- A. Probability and statistical concepts
 - Descriptive statistics.
 - Probability: basic concept and computational rules.
 - Common probability distributions: discrete, continuous.
 - Fundamental sampling distributions.
- B. Statistical Inference
 - One- and two-sample estimation problems
 - Point estimators. Point estimation and sampling distribution of population mean, variance and proportions. Interval estimation.
 - One- and two-sample tests of hypotheses
 - Basic concepts of hypothesis testing. Statistical inferences for means: tests for one-sample, two-sample and paired data. Inferences about population variance and proportions. Comparing two population variances and proportions.
- C. Non-parametric Procedures
 - Tests for goodness-of-fit, independence and homogeneity. Non-parametric procedures for inferences about single population, paired observations and randomness.
- D. Linear Regression and Correlation
 - Simple linear regression. Method of least squares. Linear regression estimators. Inference of regression parameters. Correlation coefficient. Residual analysis. Model checking. Aspects of multiple linear regression and non-linear regression.
- E. Time Series Analysis and Forecasting
 - Time series: trend, cyclical and seasonal components. Additive models and multiplicative models. Regression methods. Moving average and exponential smoothing procedures. Computation of seasonal index.
- F. Survey Sampling
 - Concepts of survey sampling. Sampling procedures: simple random, stratified, probability-proportional-to-size, cluster, systematic, and other sampling methods.

Lecturer: Dr. George Sun

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Recommended Literature:

*: available at TUM Asia

- Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K. Probability and statistics for engineers and scientists 9th ed. Pearson International Edition 2012 or Pearson New International Edition 2014

Traffic Impacts, Evaluation of Transport and Logistic Processes[\(back to module overview\)](#)

Keywords: Transport and Air Pollution, Noise / Vehicle Emissions Standards, Consumption of energy, Climate change, External cost of transport, Sustainable transport, Cost-benefit analysis (CBA), Multi criteria analysis (MCA), Balancing and Discussion Method,

Objective: Transportation systems, as a rule, strongly contribute to the overall emission of a country and consume considerable amounts of natural resources. Furthermore, transportation systems influence the quality of human lives. This course will introduce the interrelation between transport and the environment. Moreover, this course will represent the concept of a sustainable transportation system. Some strategies for archiving such sustainable transportation system will be worked out and discussed with the students. The second part of this module introduces the basic principles and concepts of an assessment and evaluation of transport and logistics systems. The assets and drawbacks of different assessment methods (Cost-benefit analysis, Multi criteria analysis, Balancing and Discussion Method, Cost – Efficiency – Analyse etc.) will be introduced, including application areas and initial constraints of specific assessment procedures will be discussed.

Content:

- A. Transport and Air Pollution
Air pollution in different parts of the world, sources of emission and health / environmental effects of Lead, Sulphur dioxide, Carbon monoxide, Volatile organic hydrocarbons, Nitrogen oxides, Particulate Matter and Ozone
- B. Vehicle Emissions Standards
How is emission standards measured? What kind of emission standards exist worldwide? Emission reduction with catalytic converters, Vehicle CO₂-emission / fuel economy regulations in the world
- C. Noise
Definition of sound and noise, health effects of noise, noise mitigation
- D. Consumption of energy
Worldwide energy consumption till now and future development of energy consumption
- E. Climate change / Kyoto Protocol
Types of greenhouse gases and emission sources, effects of greenhouse gases, ways of greenhouse gases emission stabilization, Kyoto-Protocol
- F. External cost of transport / internalization methods
What are “external costs of transport”, examples for external costs of transport, amount of external costs in Western Europe, How should we deal with external costs of transport?

G. Sustainable transport

What does sustainable development mean – introduction of the concept, definition of a sustainable transportation system, consequences for sustainable transportation policies / some German objectives

H. Why do we need assessment methods? – Introduction: Elements of assessment methods, target system / indicators / aggregation

I. Cost-benefit analysis (CBA)

Flowchart / elements of a CBA, indicators included into a CBA, monetarisation of indicators, discounting and sensitivity analysis, exercise: Cost-benefit analysis (CBA)

J. Multi criteria analysis (MCA)

Multi criteria analysis (first generation): flowchart, conversion of the original values into utility values, weighting, aggregation, Multi criteria analysis (second generation): relevance tree, preference matrix, exercise: multi criteria analysis (MCA) and assessment of urban effects

K. Balancing and Discussion Method

Principle of this method and examples

L. Other Assessment Methods

Ranking, Compatibility Assessment, Elimination method, Cost – Efficiency – Analyse, Combination of different methods

Lecturer: Dr. Andreas Rau

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Recommended Literature:

- Gareth Edwards-Jones, Ben Davies, and Salman S. Hussain, Ecological Economics: An Introduction ISBN 0-8654-2796-8, 2000)
- Judith Petts, Handbook of Environmental Impact Assessment, 1999
- Judith Petts, Handbook of Environmental Impact Assessment: Volume 2: Impact and Limitations, 1999
- Joseph Berechman, The Evaluation of Transportation Investment Projects, ISBN: 978-0-415-77715-5, 2009
- GTZ GmbH; Air Quality Management. Sustainable Transport: a sourcebook for policy-makers in Developing cities, Module 5a, 2004. (free download as a pdf file from internet)
- Ken Gwilliam, Masami Kojima; Reducing Air Pollution from Urban Transport Companion. THE WORLD BANK, 2005. (free download as a pdf file from internet)
- World Health Organization, Air Quality Guidelines Global Update 2005. ISBN 9289021926, 2006.
- The International Council on Clean Transportation; Passenger Vehicle Greenhouse Gas and Fuel Economy Standards: A Global Update (free download as a pdf file from internet)
- International Energy Agency (IEA) World Energy Outlook (free download as a pdf file from internet)
- IPCC: Climate Change 2007: The Physical Science Basis; (free download as a pdf file from internet)

- The Stern Review <http://www.occ.gov.uk/activities/stern.htm> (free download as a pdf file from internet)
- Handbook on estimation of external costs in the transport sector; CE Delft; Delft, February, 2008 (free download as a pdf file from internet)
- The Cost of urban congestion in Canada; Ottawa: Transport Canada, Environmental Affairs, 2006. (free download as a pdf file from internet)
- External Costs of Transport: Accident, Environmental and Congestion Costs of Transport in Western Europe; INFRAS; IWW; Karlsruhe/Zürich/Paris: the International Union of Railways (UIC), 2000 (free download as a pdf file from internet).

Basics of Traffic Flow and Traffic Control

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Key Words:

Variables of Traffic Flow, Deterministic Models, Stochastic Models, Microscopic View on Traffic, Macroscopic View on Traffic Flow, Fundamental Diagram, Kinematic Waves, Traffic Management and Control, Traffic Flow Simulation, Signal Control

Objective:

This module is organised to provide an insight into the description of traffic flow with its numerous facets, coherencies and interdependencies as well as into urban traffic management and signal control. Basics: Variables of traffic flow, fundamental diagram, kinematic waves, stationary and momentary observation. Use of distributions for the modelling of delay and queuing processes. Introduction to traffic modelling. Microscopic modelling: kinematics and dynamics of driving, car-following-models, cellular engines. Macroscopic modelling: endogenous estimation of traffic relations. Urban traffic management and control: Basic concepts and system structures, general approach to signal control, design of signal plans, design of progressive signal systems.

Content:

- A. Models for Traffic Flow on Links – Model Description, Kinematics, Definition, Sub-Microscopic View, Variables of Traffic Flow, Empirical Data, Probability Distributions, Microscopic Traffic Flow Models, Macroscopic Traffic Flow Models
 - Exercise 1 – Variables of Traffic Flow, Distributions
 - Exercise 2 – Fundamental Diagram, Theory of Continuum
- B. Models for Traffic State Estimation in Networks – Endogenous Estimation of Traffic Relationships, Estimation without Traffic Model, Estimation with Traffic Model, Routing Algorithms
 - Exercise 3 – Endogenous Estimation of Traffic Relations, Propagation of Traffic Streams, Route Search Algorithms
- C. Models to Determine Delays and Stops – Queuing Theory, Deterministic Models, Stochastic Models, Delay Model according to Webster, Model by Kimber and Hollis
 - Exercise 4 – Deterministic Delay Models, Stochastic Delay Models
- D. Traffic System Simulation and Further Aspects – Basics and Theory, Simulation Statistics, Simulation Study Workflow, Vehicular Traffic Simulation: Examples, Pedestrian and Bicycle Simulation, Data Fusion, Multiscaling, Model Coupling

- E. Urban Traffic Control with Traffic Signals – Isolated Junctions: Introduction and Calculation of Signal Plans, Introduction to Coordinated Signals
- Exercise 5 – Urban Traffic Control with Traffic Signals

Lecturer: Prof. Dr. Fritz Busch

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Recommended Literature:

- Daganzo, C. [1997]: Fundamentals of Transportation and Traffic Operations. Pergamon, New York
- Kerner, B. S. [2004]: The Physics of Traffic. Springer, Heidelberg. ISBN: 3-540-20716-3.
- Leutzbach, W. [1988]: Introduction to the Theory of Traffic Flow. Springer, Heidelberg, Berlin.
- May, A. [1990]: Traffic Flow Fundamentals. Prentice Hall, Englewood Cliffs, NJ.

Transport and Urban Planning

[\(back to module overview\)](#)

Key Words: Transport and urban planning processes, Transport and land use, Transport Modes and Networks, Transport Data and Surveys, Traffic Impact Assessment, Transport Demand Analysis, Planning for Parking

Objective: The module provides the basic knowledge about transport, mobility and urban planning. The main topics are: reasons for traffic, spatial and temporal traffic distribution, relationship between planning and design of the infrastructure and the assignment of functions in cities and conurbations, dependencies between supply and demand. The theory of travel demand modelling (4-steps-algorithm for travel demand estimation, etc.) is another important topic in this lecture.

Content:

1. Transport and Urban Planning Basics – What is Urban Transport Planning and why the need for it.
2. Transport and Urban Planning Objectives – Concept of Sustainability and Sustainable Developments
3. Transport and Urban Planning Issues - Evolution of cities and planning, Transport and urban issues in large cities, Problems of developing countries
4. Planning Process - Urban planning processes, Levels of planning, The Singapore urban planning practice, land use and development control
5. Planning Methodology - Population and employment forecasting methods, Plan formulation and evaluation
6. Transport and land Use Interaction - Characteristics of urban structure, Transport and land use interaction, spatial interaction models,
7. Transport Modes and Networks – Movement hierarchy, Concept of Level of Service and Temporal, spatial and modal distribution, transport safety and travel costs, Road and public transport networks

8. Transport Data and Surveys - Classification schemes for data collection, Transport system data collection, Transport user data collection
9. Transport Demand Analysis
 - I: Role of demand analysis, Economic theory and consumer behaviour, Trip-making characteristics, Simplified demand models
 - II: The classic 4-step model: trip generation, trip distribution, modal split and assignment
 - III: Discrete choice models, Activity-based methods, Simulation models
10. Assessment of Impacts – Traffic Impact Assessment, Environment Impact Assessment
11. Planning for Sustainable Transport – sustainable strategies from major cities towards space efficient urban transport planning
12. Planning for Non-Motorised Transport - Facilities for pedestrians and cyclists, planning methods
13. Planning for Parking - Types of parking, Parking surveys, Parking demand analysis

Lecturer: Dr. Evan Gwee

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Recommended Literature:

*: available at TUM Asia

- Juan Dios de Ortuzar and Luis G. Willumsen; Modelling Transport, 2001.
- Meyer, MD and Miller, EJ (2001) Urban Transportation Planning (2nd edition), New York: McGraw-Hill. ISBN-13: 978-0071200004 ISBN-10: 0071200002
- Schiller, PL, Bruun, EC and Kenworthy, JR: An Introduction to Sustainable Transportation (Policy, Planning and Implementation) 2010; ISBN: 978-1-844-07664-2
- Vukan R. Vuchic, Urban Transit : Operations, Planning and Economics; ISBN: 978-0-471-63265-8, 2005*

Highway Design

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Key Words:

Vehicle dynamics, Road transport, Road infrastructure planning, Construction, Maintenance

Objectives:

The module covers the planning and design of safe, high efficient and sustainable road infrastructure linking cities, which needs the knowledge of the dynamic behaviour of the vehicles. Driver-Vehicle-Infrastructure interactions rule the geometrical design and the requirements for pavement works. The students will study and apply road planning strategies and tools by designing the road alignment for a new project (case study). This module covers also the construction and maintenance of road infrastructure as well as the environmental issues, e.g. noise emission.

Contents:

- Introduction - Transport modes; Intermodal transport; Vehicles and transport infrastructure
- Interaction between vehicle and pavement; Vehicle performance, Traction and Braking; Road grip, Pavement roughness and suspension systems; Pavement quality evaluation; Riding comfort
- Road alignment, Design features for horizontal alignment and vertical road level; Cross-section design, Pavement surface drainage
- Environmental issues - Road planning and environmental aspects; Noise; Noise protection measures; Bundling of roads and railway lines to create transport corridors
- Road planning – Case study (Student's project)
- Principles of computer aided road design - Digital Terrain Model; Planning procedures and output (Visualisation, Set-out)
- Road pavement works - Substructures (Earthworks); Materials; Drainage installations
- Asphalt pavements – Pavement design, Materials, Installation and performance
- Concrete pavements – Pavement design, Materials, Installation and performance; Pavements for industrial areas, container terminals, harbours and other areas receiving heavy loads.

Lecturer: Dr. Bernhard Lechner

Type of exams / assignments: Written exam 60 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Recommended Literature: Fwa, T.F.[2006]: The Handbook of Highway Engineering. Taylor

Internship

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Students must complete a two-month internship, either at the industry or at an academic institute. The purpose of the internship is to provide a structured and supervised work experience for the students. This helps the students to gain job related skills and apply the knowledge learned in the lectures. In addition, the students will learn how to solve industry related working task in an industrial environment, to apply the knowledge learned in the lectures and eventually to gain and practise technical skills.

Type of exams / assignments: Written report

Workload: Equivalent to full time employment for two months

ECTS Credits: 11

Master Thesis

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The Master Thesis can be undertaken in Transport & Logistic-related companies, authorities or with any department of TUM (in the latter case, the programme Director of M.Sc. in TL must agree that the chosen topic is closely related content of the Master

programme). The Master Thesis project requires the approval of the professor in charge prior to commencement. The topic of the Master Thesis should present the current state of research and beyond that the student should be able to provide scientific and practical contributions by applying scientific methods in order to handle topics in the companies.

Workflow:

- A. Release
- B. Work in Progress
- C. Submission

Type of exams / assignments: Written report

Workload: Equivalent to full time employment for six months

ECTS Credits: 30

Introduction to Business Logistics

[\(back to module overview\)](#)

Key Words:

Definitions and World Views (of Business Logistics and Supply Chain Management); Flow Management Principles; Basics of Cargo Transportation, Warehousing, Picking/Packaging Operations; Operational and Strategic levels of Logistical Planning. Best Practices and Principles of Logistical Systems Optimization.

Objective:

Introduce students to the field of Business Logistics and Supply Chain Management in the global business world, as well as to the academic field of logistics research. Developing awareness for the field's real world relevance and complexity. Introducing students to the key concepts, current definitions and meanings of Logistics, especially with the elementary "Logistics – Flow Management" concept and its practical applications at an introductory level.

Content:

- A. Footprints of Logistics, Evolution of the Field and Concepts
 - Logistics – what is it? What are the best known "footprints of logistical action"? How is logistics reflected in academic/conceptual thinking?
 - What is it that made logistics and SCM so important in today's business world? What are the major drivers and goals that are pushing and moving the field? The "grand goals" of logistics management.
- B. Developing the "logistical perspective": A way of looking at the business world - a conceptual map"
 - How to look at the business world as a logistician?: Applicability of the logistical "world view": to many types of systems – flows of materials and things, information systems, people transportation and other service systems, knowledge systems.
 - How to identify and map logistical flows. Cases from the real business world – food, fashion, automotive, building and other industries, Examples , networks of resources, objects moving through those networks, layers of directly value creating flows, of "business readiness", "strategic positioning and system design", "documentation" and "feedback" flows;) building our terminology
 - What is it that creates logistical value? "Three plus one" elementary logistical activities; Value thru transfer in space: transporting, moving, transmitting,

Value through transfer in time: warehousing, buffering, storing, Value through changes in arrangement and order: picking/packing, X-docking, consolidating/deconsolidating; Necessary supporting functions: to control, assign, mobilize. A preview to alternative concepts of flow mobilization and control – The “push” vs. - “pull” dichotomy; “Kanban” and “continuous replenishment”.

C. Logistics from “the bottom up”: Building Blocks of logistical systems and the management challenges of operating them

- What happens in the “nodes” of logistical networks – How to manage elementary node activities?: Nodes as generic elements of logistical systems: “micro”-, “meso”- and “macro” nodes in intra-company-, supply chain- and worldwide networks; Generic Activities in nodes: warehousing and rearranging, Strategic issues in node-management: Segmenting; assigning functions, location determination, capacity dimensions, choice of technologies; Down to the floor level: Issues of warehouse management: layouts, slot assignment, picking-packing strategies, etc.
- What happens along the “links” of logistical networks – how to manage elementary “Link “activities? “Links” as generic elements of logistical systems: types and levels of links; a generic model of transportation systems from a logistical perspective; Standard-issues of transportation management: network design, modal choice, route choices, dispatch and assignments of vehicles, containers, crew; from a shipper perspective: make or buy decisions, Special challenges for transportation – sustainable transport and new technological visions.
- What is it that flows? “Objects” as elements of logistical systems and how to manage them?: Typology and characteristics of primary logistical “Objects”: “physical” goods, people, non-material objects; Packaging as “interface”: functions of packaging, layers, technologies; Generic issues of packaging management: One-way vs. “recyclable” packaging, standardization/modularization, identification; Green logistics, recycling and the management of disposal “flows”.

D. On complex logistical (and SC) systems: Configuration, programming, mobilization

- Preliminary: Discussing alternative views on the relationship between “Logistics” and “Supply Chain Management”
- Introduction to complex systems design: Principal tasks of complex systems design. Layers and structures of logistical systems. Organizational/institutional, “spatial” and “temporal” systems design aspects. The “Architecture of complexity”
- Performance measurement, rationalization and continuous improvement of logistics systems Elementary concepts of controlling, selecting Key Performance Indicators, and “Best Practices” of logistics management.

Lecturer: Prof. Peter Klaus, D.B.A./Boston Univ.

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

Credits: 5

Selected Literature:

- Chopra, Meindl; Supply Chain Management. Strategy, Planning, and Operation. 5th ed. ISBN 13: 978-0-13-609451-7; 2015

- Coyle, Langley, Gibson, Novack, Bardi; Supply Chain Management, a Logistics Perspective, ISBN 978-1-305-85997-5; 2016 and earlier editions
- Goldratt; The Goal, 2nd ed., A Process of Ongoing Improvement. ISBN 0-88427-061-0; 1992.
- Jacobs, Chase: Operations and Supply Chain Management, 15th ed., ISBN 978-1-259-92179-1, 2018, and earlier editions.
- Klaus, Müller; The Roots of Logistics. A Reader of Classical Contributions to the History and Conceptual Foundations of the Science of Logistics; ISBN 978-3-642-27921-8; 2012.
- Ohno; Toyota Production System. Beyond Large-Scale Production. ISBN 0-915299-14-3; 1988.
- Stock, Lambert; Strategic Logistics Management; ISBN: 0-07-118122-9; 2001.
- Verma, Boyer; Operations & Supply Chain Management. World Class Theory and Practice; ISBN; 978-0-324-83487-1; 2010.

Recommended Literature:

*: available at TUM Asia

Dullinger, Quo Vadis, Material Handling; (in GERMAN Language) ISBN: 978-3-00-023633-4; 2008*

Edward Frazelle, World Class Warehousing & Material Handling, ISBN-10: 0071376003, 2001*

Matthew P. Stephens, Fred E. Meyers, Manufacturing Facilities Design and Material Handling, ISBN-10: 0135001056; Prentice Hall; 2009.

Timm Gudehus, Comprehensive Logistics, ISBN 978-3-540-30722-8

Dullinger, Materials Management Guide

Technische Innovationen für die Logistik, ISBN: 978-3-937-71154-6

Fischer, R.; Modularisierung als Planungsansatz für RFID-Anwendungen in der Intralogistik Lehrstuhl fml, Garching, 2016, ISBN 978-3-941702-61-5 ; (in GERMAN Language)

Decision Support for Logistics Management

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Key Words:

Concept of Decision Sciences, Decision Support Systems, Operations Research, Shortest Path Problem (SPP), Transportation Problem (TPP), Travelling Salesman Problem (TSP), Vehicle Routing Problem (VRP), Warehouse Location Problem (WLP), Orienteering Problem (OP), Team Orienteering Problem (TOP), Chinese Postman Problem (CPP)

Objectives:

This lesson will provide an overview of currently available mathematical modelling approaches and computed-based support for the solution of typical logistical decision problems. Students will learn how to model different problem types. A selected number of algorithms which solve the formal problem models will be introduced. This lesson

enables the students to detect a known problem type in real life logistics, understand the limits of optimization and the value of decision support systems in logistics.

Contents:

- A. Decision Support Systems
Necessity of Decision Support Systems in Logistics, Types of Decisions Support Systems
 - B. Formal Operations Research Problem Models
Decision Variables, Goal Function, Constraints; Algorithmic Principles: Selected Principles of Exact Algorithms (Complete Enumeration, Branch & Bound, LP), Selected Principles of Quick Heuristics, (Initial Solution Heuristics, Improvement Heuristics Greedy Heuristics), Selected Principles of Meta Heuristics (Genetic Heuristics, Further Meta-Heuristics)
 - C. Shortest Path Problem (SPP)
“How to get from A to B?” Problem Illustration, Definitions (Networks, Nodes, Edges, Symmetric and Asymmetric Networks), Selected Algorithm, Use Cases, Exercise (Modelling Networks & Distance Calculation), Literature Research
 - D. Transportation Problem (TPP)
“How much to transport from A to B?” Problem Illustration, Definition of Variables, Formal Problem Model, Selected Algorithms, Use Cases, Problem Variants, Exercise (Modelling & Solving of TPP), Literature Research (Variants of TPP & one selected Algorithm)
 - E. Travelling Salesman Problem (TSP)
“In which sequence should stops be visited?” Problem Illustration, Definition of Variables, Formal Problem Model, Problem Complexity, Selected Algorithms, Use Cases, Exercise (Modelling & Solving of TSP – Analyse Reasons for Different Results)
 - F. Vehicle Routing Problem (VRP)
“Which vehicle should serve which customer?” Problem Illustration, Definition of Variables, Formal Problem Model, Selected Algorithms, Use Cases, Problem Variants, Exercise (Master Route Planning – Comparison of Different Models and Algorithms) Literature Research (Model of VRP-TW & selected Algorithm)
 - G. Warehouse Location Problem (WLP)
“Which potential warehouse locations should be employed?” Problem Illustration, Definition of Variables, Formal Problem Model, Selected Use Cases, Problem Variants, Exercise (Modelling & Solving of WLP – Comparison of Different Algorithms), Literature Research (Models and Algorithms for the PLA Planar Location Allocation Problem)
 - H. Further Problems OP, TOP and CPP
Orienteering Problem (OP) “Which stops should not be served by a vehicle?”
Team Orienteering Problem (TOP) “Which stops should not be served by a fleet?”
Chinese Postman Problem (CPP) “Which arcs should be served in which sequence?”
- Vertical Industry Examples
- Containers (Container Types, FTL, LTL, Hinter-land-Transports)
 - Beverages (Sources, Destinations, Operators, Geographic Distribution Structure Variants, Inbound Transports (FTL), Outbound Transport (LTL))

- Food (Sources, Destinations, Operators, Geo-graphic Distribution Structure Variants, Characteristics of Food Logistics (Shelf-life Restrictions), Goods Structure (Frozen, Chilled, Dry Goods), Specifics of Food Logistics Vehicle Fleet
 - Agriculture (Milk, Timber Animals)
 - Oil & Gas (Bottled Gas Delivery for Home Combustion, Oil Delivery for Home Combustion, Filling Station Replenishment
- I. Closing Chapter
Limits of Optimization Models and Optimization Algorithms, Decision Support Systems

Lecturer: Prof. Dr. Constantinos Antoniou

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Recommended Literature:

*: available at TUM Asia

- Hillier, Frederick S. and Liebermann, Gerald J.; "Introduction to Operations Research"; McGraw Hill, Boston, Singapore; 2010.
- Brandimarte, Paolo, Zotteri Giulio; "Introduction to Distribution Logistics", ISBN 978-0-471-75044-4 Wiley, 2007*
- Ahuja, R.K., Magnanti, T.L. and Orlin, J.B., "Network flows", Prentice Hall, 1993.
- Bradley, Hax, and Magnanti, "AMP Applied Mathematical Programming"; Addison-Wesley; 1977.

Introduction to Supply Chain Management

[\(back to module overview\)](#)

Objective:

Introduce students to the field of supply chain management with its main challenges, theories and planning methods. The course will be organized as a series of lectures and exercise classes as well as in class case study discussions.

Table of Content:

- A. Introduction: what is the right supply chain for your product, supply chain performance measurement
- B. Procurement and sourcing: supplier evaluation and selection, tendering and auction theory
- C. Inventory management: forecasting, single echelon models: lot-sizing and safety stocks, beer game, supply chain inventories, Sport Obermeyer case study
- D. Global supply chain design: simple facility location models, customer order decoupling point, modelling: mixed integer programming, scenarios and uncertainty
- E. Supply chain risk management: risk typology, mitigation strategies, Genentec case study
- F. Supply chain coordination: game theoretic models, supply chain contracts, information sharing, sales and operations planning

G. After sales supply chains and closed-loop supply chain management

Lecturer: Dr. Ing. Holly Claudia Ott

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Recommended Literature:

- Chopra, S., Meindl, P. (2016), Supply Chain Management. Strategy, Planning, and Operation, 6th ed., Pearson
- Reading package (articles, case studies: announced in first session of the course)

Cross-discipline Module

[\(back to module overview\)](#)

- Selected Topics in Management Methods
Lecturer: Dr. Charles Chow

This course will present business competition from an East-East perspective extracted from the Indian Bhagavad Gita and Chinese Sun Zi's "Art of War". Participants will apply such management features for a suitable business plan involving the rural poor. In addition, the key links between business creativity and engineering disciplines will be examined for commercial sustainability. Business management during the Internet of Things (Industry 4.0) will also be discussed.

- Aspects of European and Asian History and Culture
Lecturer: Dr. Reuben Wong

This course will provide students with historical and contemporary overview of relations between Asia and Europe. The course will combine history, theory and current affairs in order to explain key factors shaping the relations today, under rapidly changing geopolitical environment. The role and interests of main actors, namely the EU, China, India, ASEAN and the US will be examined. Case studies will be used to further elaborate different approaches to regional governance systems between Europe and Asia. Lastly, some of the future pitfalls and potentials in Asia-Europe relations will also be raised.

- Selected Topics in Business Administration
Lecturer: Ms Roxane Desmicht

Interested in becoming an entrepreneur or to understand the mechanisms to run a firm? This course is relevant for you.

This course will:

- let you appreciate how market constraints offer opportunities and challenges for business enterprise.
- make you understand that rigorous thinking is crucial to a firm success, not luck.

- give you an appreciation of the various and critical decisions an entrepreneur is faced with every day

The first part of the module covers aspects of business strategy diving into managerial economics (law of supply and demand; types of competition, ...) and game theory.

The second part focuses on strategic framework and analysis. We will introduce tools like SWOT and PEST for example.

Several case studies will also be discussed to illustrate and apply the theoretical concepts.

Type of exams / assignments: written exam total 75 minutes (each part is 25 minutes)

Workload: 30 x 45 minutes

ECTS Credits: 6

Recommended Literature:

*: available at TUM Asia

- Charles Chow, Management Efficacy, Wisdom from the Indian Bhagavad Gita and the Chinese Art of War, McGraw-Hill, Singapore 2014*
- Rita Gunther McGrath, The End of Competitive Advantage, Harvard Business Review Press, Boston, Massachusetts 2013
- Hermann Simon, Hidden Champions of the 21st Century: Success Strategies of Unknown World Market Leaders, Springer, Heidelberg, Germany 2009
- W. Chan Kim and Renee Mauborgne, Blue Ocean Strategy, Harvard Business School Press, Boston, Massachusetts 2005
- Kalevi Rantanen and Ellen Domb, Simplified TRIZ, New Problem-Solving Applications for Engineers and Manufacturing Professionals, St Lucie Press, Boca Raton, Florida 2002
- www.newinventions.in (sanitary napkins in India invented by Murugan)
- www.ruby-cup.com (alternative silicon menstrual cup to conventional sanitary napkins)

Soft Skills, Business & Technical English + Excursion

[\(back to module overview\)](#)

Part A: Business & Technical English

Business & Technical English is a course designed for high intermediate and advanced students of English as a second or foreign language who wish to improve their written and spoken communication in English.

COURSE CONTENTS

The course comprises two components:

A: Business English

Topics covered in this module include professional workplace writing and business presentations, sensitivity to cultural differences in communication, and strategies of persuasion, and business etiquette.

B: Technical English

Topics covered in this module include technical writing style, research writing, technical reports, technical presentations, job and/or scholarship application letters.

EVALUATION

There will be a one-hour written final examination on topics in business and technical English covered in the course.

EXPECTATIONS

1. **Regular and punctual class attendance**
2. **Completion of all readings/assignments.** Late assignments will not be accepted, except in case of legitimate absences. If you miss a class, you are responsible for getting previous class material from another student and completing all assignments for the next class.
3. **Speaking English at all times** – You must speak English in class during both whole- class discussions **and** small-group or paired activities with a partner.
4. **A general willingness to participate** – This means you demonstrate an interest in the class by asking questions and offering opinions on the various topics discussed in class.

Lecturer: Dr. Carmel Heah

Type of Exam: written exam 60 minutes

Workload: 80 x 45 minutes

Part B: Excursion Practical Experience in Warehouse & Distribution (organised by TUM Asia staff)

Total credits for Part A + Part B:

ECTS Credits: 8

Rail Transport and Rail Planning

[\(back to module overview\)](#)

Key Words:

Rail transport, Rail infrastructure planning, Construction, Maintenance

Objectives:

This module introduces the general requirements and procedures for rail infrastructure planning based on the running behaviour and the performance of rail vehicles. The module is discussing the specific wheel-rail interface, the effective forces guiding the wheel sets (equivalent conicity), the determination and evaluation of track quality, the requirements for designing track alignment and layout, the tools to determine cant and cant deficiency, the procedures to design transition elements, the tilting train technology, the operational demands and respective track arrangements for passenger, freight and operational stations. Requirements to ensure passenger comfort and safety are introduced.

Contents:

- A. Introduction; Rail transport and rail vehicles
- B. Traction and Braking, Driving resistance forces
- C. Wheel-rail Contact; Principles of wheel set guidance, Equivalent Conicity, critical speed; Track quality
- D. General rail track design requirements and limits; Safety, Passenger Comfort, Wear
- E. Cant, Cant Deficiency, Ramps and Transition Curves, Measures to increase speed on existing rail infrastructure; Tilting Trains
- F. Track Alignment (Mainline Rail); Horizontal alignment and vertical rail level
- G. Tutorial: Track Alignment Planning
- H. Turnouts (switches and crossings); Design and Track layout
- I. Stations: Operational demands and Track layout
- J. Tutorial: Station Planning
- K. Cross-section design of railway tracks
- L. Trackside Installations for train control and signalling systems.

Lecturer: Dr.-Ing. Bernhard Lechner

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Trackworks I

[\(back to module overview\)](#)

Key Words:

Railway track design and construction, Ballasted tracks and ballastless tracks

Objectives:

This module provides an understanding of the forces acting between vehicle and track, the load distribution within the track superstructure into the substructure (Earthworks or civil structure) as well as the environmental impacts on the track performance, the respective general requirements for the design and the construction of rail infrastructure. In addition, this module will cover the rail track engineering required for the track design, the construction, the maintenance and the renewal of tracks for a variety of rail infrastructures (conventional and high speed). Conceptual design and structural performance analysis of conventional and ballastless track systems will be discussed.

Content:

- Introduction; Track loading (static and dynamic impacts)
- General track design requirements (RAMS)
- Track systems; Subsystems and components (requirements and approval procedures)
- Track installation, Track maintenance, Rehabilitation and renewal
- Track stiffness; Track modelling, Tools for calculations, Simulation and analysis
- Tutorial track modelling and analysis
- Environmental impacts; Track stability of continuously welded rail (CWR)
- Tutorial track stability
- Ballastless tracks for conventional and High Speed lines
- Ballastless track systems, general design principles and layout

Lecturer: Dr.-Ing. Bernhard Lechner
Type of exams / assignments: written exam 75 minutes
Workload: 45 x 45 minutes
ECTS Credits: 5

Recommended Literature:

- Lichtberger, B.[2005]: Track Compendium. Eurailpress

Trackworks II (Urban Rail Focus)

[\(back to module overview\)](#)

Key Words:

Ballastless track design, Special tracks for urban rail transport

Objectives:

This module provides an introduction on ballastless track system design procedures, the special features of Metro and light rail systems, the train track interactions, the track layout and alignment for urban rail systems, the track cross section design including trackside equipment, the sources, propagation and impacts of noise and vibrations including measures to counteract, the design of special floating slab tracks, the environmental impacts, the design of green tracks, the design and construction of tram-tracks, the embedded track systems.

Content:

- Tools for Ballastless Track Design
- Tutorial Ballastless Track Design
- Asphalt and Concrete Pavements for Ballastless Track Systems
- Substructure Requirements; Earthworks and Civil Structures
- Introduction: Metro and Light Rail
- Train-track Interactions; General Requirements for Light Rail Systems.
- Alignment and Track Layout for Urban Rail Systems
- Ballastless Tracks for Urban Rail (LRT, Metro, Tram)
- Noise and Vibration; Sources, Propagation and Effects
- Design of Floating Slab Tracks
- Tutorial Design of Floating Slab Tracks
- Environmental Impacts; Green Tracks
- Tram-tracks, Open Tracks, Embedded Tracks

Lecturer: Dr.-Ing. Bernhard Lechner

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Public Transport Planning

[\(back to module overview\)](#)

Key Words:

Different kinds of transit modes and their functional characteristics, geometry and types of transit lines, transfers, increase of transit speed, stopping regimes and stops, public transport scheduling

Objectives:

This course will give an introduction to public transport planning. The lecture will start with a discussion about the advantages / disadvantages and the functional characteristics of transit modes and their capacity. The geometry and types of transit lines and transit networks are the following topics. How to organize transfers and increase the transit speed to improve the passenger convenience and the efficiency of the public transport network are also topics discussed in this lecture. The introduction to public transport scheduling is the last topic in this lecture. The objective of this lecture is to provide in-depth knowledge about the planning and organizing of public transport networks.

Contents:

- A. Different kinds of transit modes and their functional characteristics;
Bus, tram / streetcar; bus rapid transit (BRT); light rail transit (LRT); light rail rapid transit (LRRT); rail rapid transit (RRT, Metro, MRT, MTR) right-of-way, vehicle guidance, guided vehicles support, propulsion, TU driving and control
- B. Types of transit lines – Planning objectives of transit lines, line length, alignment, interconnections among lines (independent and integrated lines), radial lines, diametrical lines (transverse or through), tangential line (cross-town), circle or ring lines, loop lines, trunk with branches and feeders
- C. Rail transit network types - Radial networks, radial/circumferential networks, rectangular or grid network, ubiquitous networks
- D. Transfers - coordinated scheduling, classification of transfers by headway length and line type, transfer between local and express trains
- E. Increase of transit speed - Vehicle design and performance characteristics, intersection and street design, traffic signal priorities for transit, transit stops, improvement of transit operations elements
- F. Stopping regimes and stops - Accelerated rail transit operation with fixed stopping schedules
- G. Public transport scheduling: Trip building, - Calculation of headways, terminal times, cycle times, etc.; trip building for double tracks, single tracks and circle lines; exercise: trip building for single and double tracks.
- H. Public transport scheduling: Block building - assignment of cars / trains to all trips specified in the timetable; exercise: block building
- I. Public transport scheduling: Run-cutting - determination of work duties for individual drivers during the day; rough and precise estimation of necessary work duties; run-cutting procedure, preparation of duty flow paths, split duties; exercise: run-cutting
- J. Public transport scheduling: Fixed rotating duty rosters, - General structure of rotating duty rosters, preparation of the duty roster structure, development of duty

sequences, duty arrangement in in the rotating duty roster); exercise fixed rotating duty rosters

Lecturer: Dr. Andreas Rau

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Recommended Literature:

*: available at TUM Asia

- Vukan R. Vuchic, Urban Transit : Operations, Planning and Economics; ISBN: 978-0-471-63265-8, 2005*

Train Control and Signalling Systems

[\(back to module overview\)](#)

This module introduces to the students to train control and signalling systems. The benefits and challenges of techniques used will be analysed. Turnout, signals, and all track based equipment, facilities, electronic interlocking and train control systems will be covered too. Risk analysis and assessment of electronic systems and management of train scheduling and transport risk will be discussed.

Content:

- A. Introduction
- B. Identification of Signalling Functions
- C. Turnouts and Signals
- D. Train Control Systems / Control Command Signalling
- E. Interlocking - Train Control Centres
- F. Risk Analysis of Electronic Systems
- G. Train Scheduling
- H. ERTMS (GSM-R and ETCS)
- I. Operational Risk Management
- J. Case Studies

Lecturer: Dr. Michael Leining

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Rolling Stock

[\(back to module overview\)](#)

This lecture covers the wheel-rail interaction, running behaviour in curves and straight track, propulsion systems diesel, electricity AC and DC, energy efficiency including regenerative braking, running gear and vehicle construction, including primary and secondary suspension devices, wheelsets, bogie frames and body shells relevant norms and design rules, tendering procedure and homologation process, safety issues as collision safety derailment safety, fire safety, environmental aspects as external and internal noise, particle emission, space consumption, reliability, availability, maintainability, diagnosis systems and their environment and benefit.

Content:

- A. Trains in General as System Elements of Rail Traffic
- B. Wheel-Rail Interaction on Curves and Straight Track
- C. effects of Wheel and Rail Profiles, Propulsion Systems

- D. Construction of Wheelsets and Primary Suspension
- E. Construction of Bogie Frames and Secondary Suspension
- F. Body shells of EMU and DMUs, Locomotives and Wagons
- G. Tendering and Homologation
- H. Risk Analysis and Risk Management/Safety
- I. Environmental Issues
- J. Case Studies

Lecturer: Prof. Dr. Ing. Markus Hecht

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Traffic Operation and Control (ITS)

[\(back to module overview\)](#)

Key Words:

ITS Technologies, Urban Traffic Control, Public Transport Control, Traffic Control Centres, Motorway Control Systems, Integration in Traffic Control

Objectives:

This module aims to improve the understanding of the general approach of traffic control and Intelligent Transportation Systems (ITS) in the urban and the motorway context; it introduces the principles of different systems, their technical approaches and it analysis ITS applications in urban, extra-urban and integrated systems. It explains the objectives, measures, methods and algorithms of implementing ITS. The module builds on “Basics of Traffic Flow and Traffic Control” and is closely related to the module “Transportation Modelling and Simulation Tools”

Contents:

A. Part 1

- Introduction and Conceptual Framework – Definitions, Control-Theory and Traffic Control, Traffic Management Approach, Mobility Management versus Traffic Management, ITS as concept, basics of ITS-architectures, Quality Management, History of TC.
- ITS technologies (TEC) – System architectures, traffic/environment detection, signs, controllers, communication.
- Urban Traffic Control (UTC) – Basic Structure, objectives, network/section/node, strategic/tactical/operational level, local actuation Network oriented signal control methods (plan selection, adaptive systems) Forecast Methods in Traffic Control Network oriented signal control methods (plan selection, adaptive systems), Green Wave Calculation, overview about existing methods, Network Coordination or local actuation example.
- Integration in Traffic Control (ITC) – Data fusion, strategy management, networking of systems, parking, tolling, mobility/road pricing

B. Part 2:

- New Technologies – Cooperative Systems and Latest Research
- Motorway Control Systems (MC) – Objectives, MARZ Algorithms, Incident Detection, Ramp-Metering, Exercise
- Advanced Traffic Control (ATC) – Tolling and Road Pricing
- Green Wave Recap
- Public Transport Control
- Electro Mobility
- Evaluation and Assessment – Methodology, Assessment Procedures

- Case Study Munich
- Design of ITS Architectures – Group Work, Workshop

Lecturer: Prof. Fritz Busch

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Recommended Literature:

- Boris S. Kerner The Physics of Traffic: Empirical Freeway Pattern Features, Engineering, Applications, and Theory (Understanding Complex Systems), 2004.
- Juan Dios de Ortuzar and Luis G. Willumsen; Modelling Transport, 2001.

Transportation Modelling and Simulation Tools

[\(back to module overview\)](#)

Key Words:

Simulation models, Deterministic and stochastic processes, Calibration and validation of models, Route choice models, Modelling ITS, Public transport, Pedestrian modelling, Trip Generation, Trip Distribution, Mode Split, Trip Assignment, Customising simulators, Extensive Simulation Exercises, Practical Data Acquisition

Objectives:

The students will learn how to use macro- and micro-simulation as a tool to assess traffic engineering and transport planning measures. This includes theoretical background of the methods implemented in the tools as well as extensive practical exercises in using the software and some advice how real world simulation projects can be structured. Additionally the students will have to gather their own data from the street to set up a realistic simulation of an own small example within the Singapore road network.

Contents:

- Introduction –Definitions, Simulation as a numerical solving method, Objective of simulation, Randomness in simulation (Deterministic and stochastic processes, understanding random number generators, reproducibility, sample sizes)
- Simulation Tools – Examples
- Behaviour Models Part 1 – Lane Change Models, Car Following Models
- Simulation Studies – Guidelines
- Output Evaluation – Evaluations (Measures of effectiveness, simulation result vs. guidelines; delay time and queue length definitions, network wide measures of effectiveness, visualization 2D and 3D)
- Behaviour Models Part 2 – Macroscopic Modelling (trip generation, trip distribution, modal split, trip assignment, VISUM)
- Traffic Assignment
- Calibration Exercise – Calibration and validation of models (Definition of Calibration and Validation, Warm up period, Measures of fitness, simulation project workflow, guidelines)
- Exercises and Field Data – Signal control modelling, Data needs for simulation models (Supply: road networks; digital roadmaps, Supply: public transport system; time table data, Supply: traffic control data, Demand data)
- MAT Sim – Macro, Meso, Micro (Mesoscopic simulation models, Integrating macro and micro)
- Conclusion and Wrap Up

Lecturer: Prof. Fritz Busch

Type of exams / assignments: written exam 75 minutes
 Workload: 45 x 45 minutes
 ECTS Credits: 5

Recommended Literature:

*: available at TUM Asia

- D. May; Traffic Flow Fundamentals, ISBN: 0-13-926072-2, 1990*

Soft Skills, Cross Cutting Fundamentals and Methods

[\(back to module overview\)](#)

This module consists of the courses "Intercultural Aspects of Transportation Management" and "Scientific Paper Writing".

In the beginning, the students will be introduced to the standards of scientific work. In block seminars, the students will learn and practice the fundamentals and methods of scientific paper writing in individual and group work.

Apart from that, there will be raised the students' awareness and understanding of cross-cultural aspects and contexts. The students will not only be introduced to the theoretical principles and models of intercultural communication, but they will also get practical cross-cultural experience by co-operating with their international fellow students. Critical intercultural interaction situations will be analysed and discussed in class.

Together, there will be developed solutions for dealing with intercultural differences.

By applying scientific methods, every student prepares a presentation about a transportation related topic from his/her country of origin. During the scientific presentations as well as during the following academic discussions there will be highlighted and discussed intercultural issues of transportation management.

Lecturer: Prof. Fritz Busch, Dr. Birgit Vierling, Dr.-Ing. Uchendu Chigbu

Type of exams / assignments: written exam

Workload: 30 x 45 minutes

ECTS Credits: 3

Industrial Logistics

[\(back to module overview\)](#)

Key Words: Supply chain characteristics of manufacturing industries, Importance of location factors, manufacturing typology, Global aspects of manufacturing, Global strategic and operational procurement, Major SCM processes and activities, Specifics in production planning (Master production scheduling, Material Requirements Planning [MRP]), Lean Production Philosophies and Toyota Production System, Methods and IT technologies (e.g. dynamic value networks, Just-in-Time, Enterprise Resource Planning, eBusiness, Six Sigma, Kanban)

Objectives: Introduce students in specifics of global industrial manufacturers and suppliers and their main activities within their supply chain. Explain basic process models, methods & technologies and illustrate how they can give business a competitive advantage.

Contents:

A. Globalization

SCM driver and global manufacturing: globalization, focus on core competence / outsourcing trend, customer orientation and requirements (mass customization, speed, flexibility), Characteristics of industrial supply chains; organizational forms of industrial supply chains; Supply Chain Operations Reference [SCOR] Model (Processes, Performance indicators, best practices), examples for supply chains /

production networks of selected manufacturing industries (automotive, electrical and electronics, machine tools industries); implications for logistics.

B. Procurement and Inbound Logistics

Strategic procurement and operational procurement process chain from demand planning to payment and reporting, procurement ethics and performance measures.

Inventory Management: Basics of inventory and Economic Order Quantity (EOQ) Model; replenishment and ordering under uncertainty, ABC and XYZ analysis.

Warehousing: strategic warehousing, warehouse types, operations and IT support, Warehouse location, -size and -layout.

C. Production and Production Logistics (Manufacturing)

Planning concepts, production planning processes: forecasting and demand planning, sales & operations planning, master production scheduling, Material requirements planning (MRP1), capacity planning, Toyota production system [TPS]

D. Methods and Technologies in Manufacturing Supply Chains

Lean management methods, lean basics and lean methods and techniques: Elimination of waste, Just-in-Time, Kaizen, Kanban, Six Sigma, and Vendor managed inventory, etc.; Value stream mapping, dynamic value networks driven by behavioural forces.

Measuring performance: selected supply chain metrics (SCOR metrics, Balanced Scorecards, performance indicators)

IT technologies (internet, real time, e-procurement), Enterprise-wide IT application systems (Enterprise resource planning [ERP] systems).

Lecturer: Dr. Hanns Zeltinger

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Recommended Literature:

- Bowersox – Closs – Cooper: Supply Chain Logistics Management, McGraw-Hill 2010
- Jacobs – Chase – Aquino: Operations– and Supply Chain Management, McGraw-Hill 2009
- Stevenson: Operations Management, McGraw-Hill, 2009
- Abele – Kluge – Naeher: Global Production Handbook, 2008
- Stadler – Kilger: Supply Chain and Advanced Planning, Springer, 2002
- Leenders – Johnson – Flynn – Fearson: Purchasing and Supply Management, McGraw-Hill, 2006

Consumer Industry Supply Chain Management

[\(back to module overview\)](#)

Key Words: Supply Chains, consumer goods specificities, trends and challenges, IT and other technologies, distribution and supply of consumer goods, retail logistics, Efficient Consumer Response, supply chain integration, e-Commerce

Objectives: This lecture addresses the issues of logistics and supply chain management from the perspective of national and international consumer goods producers, wholesalers, retail chains and e-commerce companies from the food and non-food

branded goods industries, fashion and luxury goods, home supplies etc. It shows the structures of logistics across the value chain by analysing each step from the producer to the consumer. Also, different possibilities of designing and integrating supply chains will be analysed. Throughout the lecture, case studies will be discussed to apply the theory in practice.

Contents:

- A. The World of Consumer Goods Logistics and Supply Chains: The Consumer Goods Sector in the Economy; Difference between Consumer and Industry Supply Chains; Trends and Challenges in the Consumer Goods Sector.
- B. Supply Chain Management in Consumer Goods Industries: Approaches for Implementing Supply Chain Management in the Consumer Goods Industry; Challenges of Supply Chain Management; Optimizing Supply Chains.
- C. From store to supplier – an Upstream Walk along the Consumer Goods Industry Supply Chain: Instore-Logistics; Distribution of goods to the retail outlets; Activities on the Supply Side.
- D. Special Strategies to Optimize the Consumer Goods Industry Supply Chain: Strategies, Challenges and Success Factors of Efficient Consumer Response and Integrated Suppliers; Technical Applications and Innovations to improve Logistics Services in the Consumer Goods Supply Chain.
- E. E-Commerce and innovative applications: Logistics and Potentials of E-Commerce; Innovative Business Models and Applications.

Lecturer: Prof. Dr. Christian Kille

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Recommended Literature:

- Zentes/Morschett/Klein: Strategic Retail Management, Springer Verlag, 2011. ISBN 978-3-8349-2536-7
- Plus Provided Articles on Moodle

Logistics Service Provider (LSP) Management

[\(back to module overview\)](#)

Keywords:

Service Management Theory, Network Industries, Marketing Intelligence, Strategic Environment, Deregulation, Value Chain Designs, Less-than-Truckload (LTL) Network, Courier, Ex-press, Parcel (CEP) Services, Full Truck load/Container load (FTL) Services, Contract Logistics, Operations Management, Pick-up and Delivery, Line Haul, Hub- and Transshipment Operations, Tracking-and Tracing, Order Processing, Warehouse Operations, Human Resource Management in Services, Marketing and Pricing Services, Strategic Design of Services

Objectives:

An ever increasing share of logistics is being outsourced to Third Party Logistics Service Providers (“3PL”, “LSP”). The successful management of these kinds of companies poses challenges that in many respects are different from traditional “industrial” management practices. The course offers an overview of the worldwide LSP industry, its key players, and best management practices, as well an introduction to relevant theoretical concepts of advanced service management. It aims to provide an introductory

preparation to students for potential careers in logistics services, as well as an understanding of typical business models and management issues relevant for successful dealings with logistics outsourcing partners.

Contents:

- A. On Management and what is special about service and logistics service provider management
- Management, Services, Service Industries, Logistics Service Providers
Basic concepts: „Management“, „Services“, „Logistics“; Logistics Service Companies: Initial typology and descriptive categories: by function, by mode/technology, by object, by geography, by ownership and statutory characteristics, Third-party vs. private (in-house) operations, etc.; A look backwards: Early contributions to transport management; Doing LSP-research: Information resources”
 - On the Environment for LSP Management Today: Europe, US, Asia, the Global Economy
A conceptual Framework for Analysing Business Environments; Review: selected „megatrends“ and their relevance to LSP management: „privatisation and deregulation“, „globalization“, „shareholder value logic of business success“, „sustainability“; More Industry-specific developments: The economic environment and the “crisis”; physical infrastructure developments; legal and political changes; demography and labour markets; new technologies.
- B. Overview on the Worldwide 3PL Service Industries, Important Market Segments and Key Players
- Market Segments, Market Leaders, LSP specific value chains and perceived success factors
Approaches to market definition and segmentation; The “CEP” markets and key players; “Less-than-truckload (LTL)” networks and key players; “Full Load (FTL/FCL)” transportation and key players – surface and ocean; the global air&ocean “Forwarding” business; “Bulk transport” – via barge, pipeline, rail, ocean shipping and related storage activities.
- C. LSP Operations management: selected Issues
- Human Resources – Managing People in Service Operations
Why “people management” is so critical in service operations: interactive, mobile, problematic status perceptions; Some fundamentals of organizational behaviour, motivation and leadership: Herzberg’s Two Factor theory, its applications to LSPs and contingencies: Technology, environment, relationships; Creating a context: Alternative organizational structures; The special issue of subcontractors
 - “Micro-Management” of basic logistical activities: Transportation and fleets
Review of transportation management issues: network; design, modal choice, route choices, dispatch and assignments of vehicles, containers, crew; Fleet management: configuration, financing options, replacement; Alternatives to dispatch operations, problems of computer assisted dispatch; centralization vs. decentralization, driver assistance systems; Other issues: Procurement
 - “Micro-Management” of basic logistical activities: Warehouse, Terminal and Break-bulk Operations
Review of warehouse management issues: Segmenting; as-signing functions, location determination, capacity dimensions, choice of

- technologies; layouts, slot assignment, picking-packing strategies; Alternative designs to break-bulk and cross-docking operations
 - LSP Marketing and Sales
 - A few fundamentals of Marketing: the “4P” concept of the marketing mix, demand and supply “fit” ,etc.; Product design and the service quality issue; Service promotion for intangibles; Typical Pricing issues for LSPs: pricing structures, fixed-cost intensities; The “channel” issues for LSPs: direct vs. intermediate selling; Organizing the sales and marketing functions: alternative approaches
 - Controlling LSP Operations
 - Brief introduction to the “languages” of controlling: Accounting, Budgeting, KPI’s, reading financial and other controller reports; Key Performance Indicators: financial; Key Performance Indicators: operational; the multidimensional “Balanced Scorecard” concept; Special issues: fraud, security, CO2-footprints
- D. Strategic management of LSPs: Market choice, Configuration and the Management of competitive Advantage
- Brief introduction to the concepts of Strategic Management
 - The concept of sustainable “competitive advantage”; Domain choice as the first challenge of Strategic Management: the issue and instruments: environmental scanning, SWOT-Analyses, etc.; Portfolio analysis of multi-business companies; Special issues: antitrust; Extra reading: the “time” dimension of competition
 - Strategic planning applied: the case of contract logistics
 - Analysing the domain; what business is “contract logistics”? Required capabilities and resources (assessing the strategic “fit”); the process of planning for a contract logistics project; Pricing, budgeting, controlling; Leveraging the success factors; Organizational issues and continuous improvement
- E. In depth Case Studies on the strategic management of LSPs
- Case reading and identification of management issues; Individual case preparation

Lecturer: Prof. Dr. Peter Klaus

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Selected Literature:

- Bardi, Edward J., John J. Coyle, Robert A. Novack (2006), Management of Transportation (Int. Edition), Thomson Learning
- Herzberg, F. “One more time: how do you motivate employees?” in HBR Sept-Oct. 1987, pp. 5-16
- Klaus, Peter, Logistics (1992/2008) – Flow Management (informal engl translation of) Klaus, Peter (2002), Die Dritte Bedeutung der Logistik : Beiträge zur Evolution logistischen Denkens, Edition Logistik; Bd. 1, Deutscher Verkehrs-Verlag, Hamburg
- Lovelock, Christopher (1984), Services Marketing: Text. Cases, & Readings, Prentice-Hall, Englewood Cliffs.
- Porter, Michael M. (1979), How Competitive Forces Shape Strategy In: Harvard Business Review, March/April 1979.

- Sasser, Earl. W. (1976) "Match Supply and Demand in Service Industries" in: Harvard Business Review, Issue Nov./Dez 1976.
- Vargo, Stephen L. and Robert Lush (2004), "Evolving to a New Dominant Logic for Marketing" in: Journal of Marketing, V.68 (Jan. 2004) pp. 1-17.
- Zeithaml, Valarie A (1981), "How Consumer Evaluation Processes Differ between Goods and Services" in: Donnelly, James H. and W.R. George (eds.), Marketing of Services, AMA Chicago.

Recommended Literature:

- Bardi, Edward J., John J. Coyle, Robert A. Novack (2006), Management of Transportation (Int. Edition), Thomson Learning
- Herzberg, F. "One more time: how do you motivate employees?" in HBR Sept-Oct. 1987, pp. 5-16
- Klaus, Peter, Logistics (1992/2008) – Flow Management (informal engl translation of) Klaus, Peter (2002), Die Dritte Bedeutung der Logistik : Beiträge zur Evolution logistischen Denkens, Edition Logistik; Bd. 1, Deutscher Verkehrs-Verlag, Hamburg
- Lovelock, Christopher (1984), Services Marketing: Text. Cases, & Readings, Prentice-Hall, Engle-wood Cliffs.
- Porter, Michael M. (1979), How Competitive Forces Shape Strategy In: Harvard Business Review, March/April 1979.
- Sasser, Earl. W. (1976) "Match Supply and Demand in Service Industries" in: Harvard Business Review, Issue Nov./Dez 1976.
- Vargo, Stephen L. and Robert Lush (2004), "The Four Service Marketing Myths: Remnants of a Goods based, Manufacturing Model" in: Journal of Service Research, V.6 Nr. 4, pp. 324-335.
- Zeithaml, Valarie A (1981), "How Consumer Evaluation Processes Differ between Goods and Services" in: Donnelly, James H. and W.R. George (eds.), Marketing of Services, AMA Chicago.

Health Care Logistics

[\(back to module overview\)](#)

Keywords: Value Chain Management, Health Care, Operations Management, Process Management, Inventory Management, Order Management, Clinical Pathways, Strategic Procurement, Sourcing Strategies, Electronic Procurement, Bull Whip Effect, Demand Forecast, Internationalization, Privatization

Objectives: Aim and scope of this course are the special aspects of logistics and supply chain management in the health care industry. This course offers at first an introduction to the fundamentals of health care management. This industry is currently undergoing a phase of deregulation, which leads to privatization, professionalization and internationalization. This framework will be discussed with the help of several decisions situations. Furthermore students learn to understand the basic mechanisms of the health care value chain, develop a sound knowledge of appropriate tools and techniques how to management supply chain management activities and learn how to evaluate logistic processes in this special field of application. Special emphasis is put on strategic aspects of procurement and logistics in health care. Management games and case studies will be integrated in this course.

Contents:

- A. Introduction to Health Care Management
Some Fundamentals; Health Care Systems in Comparison; Creating a Value Based Competition in Health Care, Challenges for Modern Hospital Management; Structural and Process Management in Hospitals; Strategic Management in Health Care; Privatization, Professionalization and Internationalization of the Health Care Industry
- B. The Health Care Value Chain:
Aim and Scope of Concept, Purchasing and Materials Management; (Fundamentals of Inventory Management, Classification of Material Types, Demand Forecast, Order Management); Inventory Management Game; Selected Topics of Hospital Procurement; Electronic Procurement in Health Care; Outsourcing of Logistics
- C. Selected Issues in Strategic Sourcing and Logistics for Hospitals
On the Strategic Relevance of Procurement; Sourcing Strategies; Supplier Management; Strategic Procurement Portfolios, Vendor Managed Inventory and other Concepts
- D. Case studies

Lecturer: Prof. Dr. Jörg Schlüchtermann

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Recommended Literature:

*: available at TUM Asia

- Bowersox, D.J.; Closs, D.J.; Cooper, M.B.: Supply Chain Logistics Management, Boston, Mass. 2012.
- Bozarth C., Handfield, R.: Introduction to Operations and Supply Chain Management, Pearson Education 2013.
- Burns, Lawton R.: The Health Care Value Chain – Producers, Purchasers and Providers, Jossey-Bass 2002*
- Chopra, S.; Meindl, P.: Supply Chain Management, Pearson Education 2012
- Christopher, M.: Logistics and Supply Chain Management, 5th ed. Harlow 2016.
- Harrison, A.; van Hoek, R.: Logistics Management and Strategy, 5th ed. Pearson Education 2014
- Kros, J.F.; Brown, E.: Health Care Operations and Supply Chain Management: Strategy Operations, Planning and Control, John Wiley 2013.
- Schneller, Eugene S.; Smeltzer, Larry R.: Strategic Management of the Health Care Supply Chain, Jossey-Bass 2006
- Weele, Arjan J. van: Purchasing and Supply Chain Management. Analysis, Planning and Practice, Business Press 2009.

Green Supply Chain and Risk Management

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Objectives:

- Green Supply Chain
Understand the revolutionary new wave of business in the 21st century – Green

Supply Chains—and its drivers and objectives. Learn how to go green in a holistic manner by applying green techniques which make companies ‘greener’ while increasing short and long term profits for the company. Explore innovative methodologies for the selected situations. Find out fatal mistakes that corporations and executives make when they go green. Discover the critical success factors for Green Supply Chain programs.

- Supply Chain Risk Management.
Know the threats of and the reasons for increasing vulnerabilities of global and local supply chains. Analyse the causes of risks categories. Learn and effectively manage the assessments of SC risks. Become familiar with method toolbox of SCRM. Know relevant SC design principles to mitigate SC risks. Use risk mitigation and avoidance techniques to deepen your understanding von SCM. See the importance of collaboration and visibility in managing resilient SC.

Contents:

Green Supply Chain

- A. Background and Evolution of Green Movement
Green Evolution; Green philosophy as part of General Sustainability Concept (CSR); International Green Policies and Standards (Club of Rome, Kyoto Protocol on Greenhouse Gas Emissions, UN Global Compact principles, Environmental Laws, Global Reporting Initiative, ISO 14000 Series on Environmental Standards, ISM’s Principles on Sustainability and Social Responsibility, German BME Code of Conduct); Green Initiatives in Singapore and Germany (Government and selected companies, e.g. Siemens, BASF, SAP, IKEA, Walmart); Sustainability Champions; Green Awards and Green Organization (e.g. Energy Star)
- B. Core Elements of Green Supply Chain
 - Green Supply Chain Planning - Green Product Design; Site and Network Planning; Life Cycle Management
 - Green Procurement and Sourcing - Drivers and challenges of Green Procurement; Effects of Green Purchasing Strategies on Supplier Behavior; Supplier Selection and developing for environmental sourcing; Trends in Sustainable Sourcing
 - Green Production - Lean production and Six Sigma; Lean & Green Production
 - Green Logistics - Green Transportation and warehousing
 - Green Packaging - Packaging reduce, reuse, recycle, reform; Getting started: redesign, re-engineer, re-align and review
 - Reverse Logistics (closed supply Loop) - Drivers and prime motivators; Closed Loop Supply Chain; Returns management, re-manufacturing, re-marketing, recycling, disposal; Difference of reverse logistics
 - Green Marketing
 - Organizational Design for Sustainability (Examples: Siemens, BASF)

Supply Chain Risk Management

- A. Examples and case studies of risk in global and local SCs; Trends in SCM and factors affecting supply chain risks
- B. Definition and Classification of SC Risks. Supply & demand risk, internal process & control risk, external risks; Taxonomies of SC risks
- C. Terms in SCRM- robustness, agility, flexibility, resilience, security
- D. General Approaches to Risk Management

- E. Introduction to decision theory
- F. Risk Assessment (identifies, analyze, evaluate)
- G. Business Impact Analysis (BIA)
- H. Responding to SC risks (mitigation and avoidance options)
- I. Methods in SCRM: risk register, 5 whys, cause and effect diagrams, Pareto analysis, check lists, Delphi method, probability-impact matrix
- J. A network view of risk
- K. Designing and creating resilient supply chains; Properties of supply chains; Design principles for resilient supply chains; Barriers against resilient supply chains
- L. Business Continuity Management

Lecturer: Dr. Hanns Zeltinger

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Recommended Literature:

- Emmett & Sood: Green Supply Chains – An Action Manifesto, Wiley, 1st edition 2010
- Roland Berger Consultants: Green Growth, Green Profit – How Green Transformation boost Business, Palgrave – MacMillan, 1st edition 2011
- Donald Waters Supply Chain Management – Vulnerability and Resilience in Logistics, Kogan Page & the Chartered Institute for Logistics and Transport (UK), 1st edition, 2009
- Martin Christopher: Logistics and Supply Chain Management, Financial times – Prentice Hall, 4th edition, 2011

Design and Applications of Material Handling Systems

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Key Words:

Material Handling, fully automated processes, transport systems, storage systems, order pick systems, production control systems, warehouse and distribution, airport logistics, harbour logistics, courier & express logistics, Third Party logistics, planning methods, design of systems, project management.

Objectives:

The lecture covers the issue of the movement, storage, handling, control and protection of materials, goods and products throughout the process of manufacturing, distribution, consumption and disposal. The focus is on the methods to design and evaluate systems, mechanical equipment, systems and related controls used to achieve these functions. Material Handling is shown in many business areas and business cases (logistics processes in transport modes like Air traffic, Harbour logistics, Warehouse and Distribution, Express logistics and LSP, production logistic). Furthermore an overview about general contractor business and Project Management will be given.

Contents:

- A. Introduction
 - Overview about lecture and definition of “Material Handling”; Change in economy, importance for logistics; MHS-requirements and basics
- B. Basic Technologies

- Load units: Basics and load units for warehousing (box, tray, pallet, container, etc.): Load units for airfreight; Load units for large volume & weight (i.e. sea freight)
- Storage technology: Structure of warehouse; automated storage and retrieval machines (overview & details); Shelves and racking including applications
- Conveyor systems: Basics; Types of conveyors; Conveyors in detail and design rules
- Sortation: Sortation as part of logistic systems; sortation principles/technologies and main applications; auxiliary components; Trends in sortation
- Robot handling: Basics and system solutions; Components of robot handling; Applications
- Picking: Basic principles; Parameter for finding suitable system; Overview of picking systems; Evaluation of concepts and comparison; Analysis of picking errors and tips how to avoid
- Packing and Loading: Terminology and basics of packing technology; Securing of load and load units; Packaging and automation – 2 areas with correlations; Trends
- Identification: Basics and overview about identification technologies; Camera - based recognition; Label based identification (bar codes, stacked codes, composite codes, matrix codes); RFID
- IT-Systems: Basics, automation levels; Warehouse Management System (functionality); Central control station / SCADA; Application cross docking; Application Kanban system

C. System Design – process, tools, characteristics

- Planning processes & design of systems: Data Acquisition and analysis; Structure planning and budgeting; Design of storage systems; Design of sorting systems, Design of picking systems
- Simulation of MHS (as option): Basics (importance, typical tasks, advantages, rules); Tool for test of software; Tool for controlling processes; Trends; Application LSP for Henkel
- Flexibility of systems (as option): Definition of flexibility; Flexibility in practise
- Ergonomics (as option): Basics of ergonomics (MTM, RSI, etc.); Comparison of picking concepts; Ergonomic design of workstations
- Availability of systems (as option): Basics, guideline FEM 9222, calculation method, etc.; Measures for high availability rate; Applications

D. Processes

- Airport logistics (reduced volume):
Air traffic basics (airports, airlines, airplanes, Air Cargo basics); Air Cargo handling (structures and process flow in CT, loading of airplanes, etc.); optional: Baggage systems (technologies, process flow, applications)
- Courier & express logistics (reduced volume):
Basics and process flow; Trends in Courier & Express business; Sorting logic; Typical layout of hubs and depots; Example DHL Leipzig / UPS Louisville
- Warehouse and Distribution:
Distribution structures; Overview about essential sectors in industry and commerce; Characteristics of some global acting sectors including applications (automotive, textile, electronics,); site visits including discussions optional: Inventory management & reducing risks, KPI
- Seaport Logistics (as option): Basic info about maritime traffic; key players; key figures; processes

- Logistic Service Providers (as option): Outsourcing as a trend – advantages and risks; Basic info and challenges for LSP; LSP and automation; 2 applications
- E. Project Management (as option)
 General contractor business, PM-Training course, How to avoid risks (Risk Management), Design of contracts for Material Handling Systems

Lecturer: Dr. Roland Fischer

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Recommended Literature:

*: available at TUM Asia

- Dullinger, Quo Vadis, Material Handling; (in GERMAN Language) ISBN: 978-3-00-023633-4; 2008*
- Edward Frazelle, World Class Warehousing & Material Handling, ISBN-10: 0071376003, 2001*
- Matthew P. Stephens, Fred E. Meyers, Manufacturing Facilities Design and Material Handling, ISBN-10: 0135001056; Prentice Hall; 2009.
- Timm Gudehus, Comprehensive Logistics, ISBN 978-3-540-30722-8
- Dullinger, Materials Management Guide

Airport and Harbour Design

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Key Words:

The aircraft technical characteristics, Aircraft manufacturer, Airport characteristics, Air Traffic management, Harbour design, Sea port planning, Design ship for port planning, Approach channel to a sea port, Harbour entrance, cargo berths, Container berth, Artificial offshore islands

Objectives:

This module gives an insight into the necessary components of airports and harbours and the planning processes for developing these sites. Besides that it offers several methods for operating airports and harbours. It covers aspects of the pre-planning process like environmental impacts that lead to the choice of location. All important components of airports and harbours will be discussed including the basics for designing them. The students will also receive in-depth knowledge about which operation and maintenance procedures are necessary to run airports and harbours successfully.

Contents:

Air Transport (22.5 x 45 min)

- A. Air transport as part of the a global transport system (historical development and drivers for success; characteristics of the product “air travel”, characteristics of air freight market),
- B. Safety and Security (definitions, accidents and fatalities in air transport)
- C. Legal basis for air transport (participants of the civil air transport systems, international air transport agreements, bodies and agencies in air transport system)

- D. Aircraft characteristics (historical development, transportation task, basics of flight physics, aerodynamics, structure, mass estimation and balance, propulsion, flight – performance and mission)
- E. Aircraft manufacturer (market forecast, organisation of manufacturing, aircraft development process, cost aspects)
- F. Airline - aircraft operator (market, globalization strategy, strategy and revenue management, cost, Low Cost Operator, extended range twin engine operations (ETOPS))
- G. Airport characteristics (airport system layout, critical components, turn around process)
- H. Air Traffic management (structure of the airspace, aircraft separation, wake vortex, new procedures)
- I. Air transport and Environment (exhaust emission, Greenhouse Gas, aviation noise)

Sea Port Planning (22.5 x 45 min)

- A. Introduction to sea port planning
- B. Stages of sea port planning
- C. Pitfalls in sea port planning
- D. Design ship for sea port planning
- E. Approach channel to a sea port
- F. Harbour entrance
- G. Turning basin
- H. Harbour basins
- I. Optimum number of berths
- J. Land area requirements
- K. Conventional general cargo terminal
- L. Container terminal
- M. Neo bulk cargo terminal
- N. Liquid bulk terminal
- O. LNG terminal
- P. Dry-bulk terminal
- Q. Sea port on artificial offshore islands

Lecturer: Prof. Dr. Dieter Schmitt / Mr. Pui Syn Kong

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5

Recommended Literature:

- <http://www.hamburg-port-authority.de/en/press/Brochures-and-publications/Documents/port-development-plan2025.pdf>
- http://www.mpa.gov.sg/sites/pdf/sn21/sn21_feature_port-of-possibilities.pdf

Urban Road Design

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Keywords:

Different modes of transport have their specific needs and impacts on the urban environment, Geometry and types of transport infrastructure have to be combined with the urban structure; Integration of public transport stops, Road designs, urban

intersections, the role of walking and cycling in cities, European and American ways of design.

Objective:

This course will give an introduction about designing urban roads in bigger cities. The lecture will start with a discussion about the advantages / disadvantages and the characteristics of different modes of transport. Urban areas in big cities or agglomerations have their particular challenges and needs of transport infrastructure. Besides the different aspects of land use, capacity of passenger transport and environmental issues, there is a need to keep the urban space in special consideration, as it is the area we live in. The objective of this lecture is to provide in-depth knowledge about the planning, designing and organizing of urban streets as spaces for living and find a way to organize transport in an efficient way for all modes and all mobility needs.

Content:

- A. Different kinds of transport modes and their functional characteristics: Motorized transport, car, freight, public transport, bus, tram/streetcar, micro bus, taxi; non-motorized transport, walking, cycling; analysis of modal split; types of traffic
- B. Planning goals and strategies for urban transport planning and their effects, environment, energy, space, noise, pollution, participation, access, acceptance, role of speed, road safety
- C. Urban intersection and their complexity, types of intersection for different traffic volumes, one way-system, roundabouts
- D. Parking for cars and busses, delivery, bicycle infrastructure
- E. Organising traffic in down-town, different row modals, European and American cities, role of pedestrian zones in city centres
- F. Planning for non-motorized traffic, accessibility for an aging population in cities, walking and cycling
- G. Public transport integration, bus stops, tram stops, interchanges, integration in urban spaces
- H. Good design for the original places, authenticity and creativity
- I. Talking to the people, how to communicate with the media, public pressure groups and the people of the neighbourhood, how to get political support

Lecturer: Dipl.-Ing. Torben Heinemann

Type of exams / assignments: written exam 75 minutes

Workload: 45 x 45 minutes

ECTS Credits: 5