



Department of Transportation Engineering

The department of Transportation Engineering offers the following programs:

1. Graduate Diplomas

1.1 Professional Diploma in Transportation Engineering

The student must complete 24 credit hours.

The student must choose at least one course from each specialization group in the course list at the diploma level.

1.2 Specialized Graduate Diploma in Transportation Engineering

The student must complete 30 credit hours.

Compulsory courses: The student must pass three courses with a total of 9 credit hours (07 06 661, 07 06 662 and 07 06 663).

Elective courses: The student can choose the remaining 21 credit hours from the diploma courses in the course list.

2. Master Degrees

2.1 Master of Engineering in Transportation Engineering

The student must complete 30 credit hours in the form of courses and an additional 3 credit hours in the form of a scientific report.

Compulsory courses: The student must complete 5 courses equivalent to 15 credit hours with at least one course from each specialization group in the course list at the Master level.

Elective courses: The student can choose the remaining 5 courses (15 credit hours) from the remaining courses in the Master's course list.

The student is allowed to choose 2 courses from another major.

2.2 Master of Science in Transportation Engineering

The student must complete 24 credit hours in the form of courses and an additional 8 credit hours in the form of a thesis.

Compulsory courses: The student must complete 4 courses equivalent to 12 credit hours from the same specialization group in the course list at the Master level.

Elective courses: The student can choose the remaining 4 courses (12 credit hours) from the remaining courses in the Master's course list.



The student is allowed to choose 2 courses from another major.

Specializations for the Master of Science in Transportation Engineering:

- Highway
- Railroad
- Surveying
- Harbor and marine structures
- Transportation planning and traffic engineering

3. Doctor of Philosophy- Ph.D. Degree

3.1 Doctor of Philosophy in Transportation Engineering

The student must complete 18 credit hours in the form of courses and an additional 24 credit hours in the form of a dissertation.

Compulsory courses: The student must complete 3 courses equivalent to 9 credit hours from the same specialization group in the course list at the Ph.D. level.

Elective courses: The student can choose the remaining 3 courses (9 credit hours) from the remaining courses in the Master's course list.

The student is allowed to choose 2 courses from another major.

Specializations for the Ph.D. in Transportation Engineering:

- Highway
- Railroad
- Surveying
- Harbor and marine structures
- Transportation planning and traffic engineering

For both M.Sc. and Ph.D. programs, two seminars are to be held by the student:

- i- First seminar (3-6 months after finishing course requirements). Suggested topic of the research, literature review and general outlines of the study should be presented.
- ii- Second seminar (2-3 months before selection of the examination committee). Final details of the study should be presented.



List of Diploma, Master and Ph.D. courses

Course Code	Course Name	Credit Hours	Exam Duration	Pre-requisites
Highway Engineering				
07 06 611	Materials Specifications	3	3	
07 06 612	Airport Engineering	3	3	
07 06 613	Road Maintenance	3	3	
07 06 614	Road Construction Equipment	3	3	
07 06 615	Tunnel Engineering	3	3	
07 06 616	Mechanical Properties of Pavement Materials	3	3	
07 06 617	Embankments Construction	3	3	
07 06 661	Computer Applications in Transportation Engineering	3	3	
07 06 662	Operations Research and Numerical Methods in Transportation Engineering	3	3	
07 06 711	Construction & Maintenance of Flexible Pavements	3	3	
07 06 712	Pavement Management Systems	3	3	
07 06 713	Roadway Economics	3	3	
07 06 714	Roadway Planning & Geometric Design	3	3	
07 06 715	Laboratory Applications	3	3	
07 06 716	Superior Performance Asphalt Pavements (Super pave)	3	3	
07 06 811	Rigid Pavement Design	3	3	
07 06 812	Soil Mechanics for Roads & Airports	3	3	
07 06 813	Flexible & Rigid Pavement Design for Airports	3	3	
Engineering Surveying				
07 06 631	Introduction to Astronomy	3	3	
07 06 632	Introduction to Geodesy	3	3	



Course Code	Course Name	Credit Hours	Exam Duration	Pre-requisites
07 06 633	Higher Geodesy	3	3	
07 06 634	Analysis & Adjustment of Surveying Measurements	3	3	
07 06 663	Technical Studies in Transportation Engineering	3	3	
07 06 731	Map Projection	3	3	
07 06 732	Adjustment of Geodetic Network	3	3	
07 06 733	Global Positioning System (GPS)	3	3	
07 06 734	Photogrammetry	3	3	
07 06 735	Hydrographic Surveying	3	3	
07 06 736	Introduction to Geomatics	3	3	
07 06 737	Cartography and Digital Mapping Systems	3	3	
07 06 738	Geographic Information System (GIS)	3	3	
07 06 831	Physical Geodesy	3	3	
07 06 832	Photo-Interpretation and remote sensing	3	3	
07 06 833	Spatial Analysis and Modeling in GIS	3	3	
07 06 834	GPS/GIS Integration for Transportation Applications	3	3	
07 06 865	Advanced Topics in Geodetic/Geomatics Surveying	3	3	
07 06 866	Leveling and Quantity Surveying	3	3	
Harbor and Coastal Engineering				
07 06 641	Breakwaters	3	3	
07 06 642	Shore protection structures	3	3	
07 06 643	Stability of shoreline	3	3	
07 06 644	Design and construction of rigid quay-walls	3	3	
07 06 645	Harbor hydraulics	3	3	



Faculty of Engineering
Alexandria University

Graduate Studies
Internal Bylaws 2011
Amended 2013

Course Code	Course Name	Credit Hours	Exam Duration	Pre-requisites
07 06 661	Computers Applications in Transportation Engineering	3	3	
07 06 662	Operations Research and Numerical Methods in Transportation Engineering	3	3	
07 06 741	Coastal Engineering	3	3	
07 06 742	Flexible quay- walls	3	3	
07 06 743	Port planning	3	3	
07 06 744	Marine platforms	3	3	
07 06 745	Soil mechanics for harbor	3	3	
07 06 841	Dynamics of soils and foundations	3	3	
07 06 842	Marine structure	3	3	
07 06 843	Offshore structure	3	3	
Railway Engineering				
07 06 621	Railway Dynamics	3	3	
07 06 622	Geometric Design of Railways	3	3	
07 06 623	Environmental Impacts of Railway Systems	3	3	
07 06 624	Railway Track System	3	3	
07 06 625	Railway Signaling and Interlocking	3	3	
07 06 626	Urban Railways	3	3	
07 06 721	Track Maintenance and Renewal	3	3	
07 06 722	Railway Stations and Yards	3	3	
07 06 723	Track Capacity	3	3	
07 06 724	Railway Transportation Economics	3	3	
07 06 725	Railway Infrastructure Design	3	3	
07 06 821	Railway Operation	3	3	
07 06 822	Railway Freight Transport System	3	3	
07 06 823	Advanced Railway Control Systems	3	3	
07 06 824	Railway Simulation	3	3	



Course Code	Course Name	Credit Hours	Exam Duration	Pre-requisites
Transportation Planning and Traffic Engineering				
07 06 651	Public Transport	3	3	
07 06 652	Transport Modeling	3	3	
07 06 653	Transportation Feasibility Studies	3	3	
07 06 751	Freight Transport	3	3	
07 06 752	Traffic Engineering	3	3	
07 06 753	Transport Planning	3	3	
07 06 754	Transportation Facilities	3	3	
07 06 755	Parking Studies	3	3	
07 06 851	Transport Economics	3	3	
07 06 852	Environment and Transport	3	3	
07 06 853	Transportation Logistics	3	3	
07 06 854	Transport and City Planning	3	3	
07 06 855	Intelligent Traffic System (ITS)	3	3	
07 06 856	Transportation Systems and Modes	3	3	
07 06 857	Application of Information Technology in Logistics	3	3	
07 06 601	Diploma Project	3	Presentation	
07 06 701	Scientific Report (M.Eng.) in Transportation Engineering	3	Defense	
07 06 705	M.Sc. Thesis in Highway Engineering	8	Defense	
07 06 706	M.Sc. Thesis in Railway Engineering	8	Defense	
07 06 707	M.Sc. Thesis in Surveying Engineering	8	Defense	
07 06 708	M.Sc. Thesis in Harbor and Coastal Engineering	8	Defense	
07 06 709	M.Sc. Thesis in Transportation Planning and Traffic Engineering	8	Defense	
07 06 801	Ph.D. Dissertation in Highway Engineering	24	Defense	
07 06 802	Ph.D. Dissertation in Railway	24	Defense	



Course Code	Course Name	Credit Hours	Exam Duration	Pre-requisites
	Engineering			
07 06 803	Ph.D. Dissertation in Surveying Engineering	24	Defense	
07 06 804	Ph.D. Dissertation in Harbor and Coastal Engineering	24	Defense	
07 06 805	Ph.D. Dissertation in Transportation Planning and Traffic Engineering	24	Defense	

Description of Courses for Graduate Programs (Diploma- Master- Doctor of Philosophy)

07 06 611 Materials Specifications

This course discusses the various methods to evaluate the suitability of materials to be used for flexible and rigid pavement layers such as sub-base, base, binder, surfaces layers, and Portland cement concrete road slabs.

07 06 612 Airport Engineering

This course discusses the engineering principals for airport design including airport classifications and the various requirements of airplanes take-off and landing, relating to the planning and design of various airport components. The study includes the detailed design of the runways, taxiways, aprons, structural design of pavement to accommodate the airplane loading conditions, safety zones around the runways, navigation aids for landing and take-off, and finally marking and lighting for airports.

07 06 613 Road Maintenance

This course discusses the main deterioration modes of the roadway pavements, identification of pavement distresses, techniques for pavement maintenance and techniques for strengthening pavement structures. The course applies these techniques to all kind of roads including flexible pavement roadways, rigid pavement roadways, and unpaved roads.

07 06 614 Road Construction Equipment

This course discusses the main equipment used in road construction in terms of properties, productivity, efficiency, etc. This equipment includes graders, bulldozers, finishers, compactors, etc.



07 06 615 Tunnel Engineering

This course discusses the main aspects of the design of tunnels such as alignment, safety and soil mechanics considerations. This includes construction of tunnels below sea level, tunnel construction using explosives, insulation of tunnels, ventilation, capacity and emergency requirements.

07 06 616 Mechanical Properties of Pavement Materials

Design of bituminous mixes (methods of Marshall — modified Hubbarred-Hveem, Smith, agg, surface-voids consideration). Asphalt pavement structures (flexible pavement, asphalt macadam, asphalt concrete, surface treatment). Additives used in mixes. Sulphur in asphalt paving materials. Recycling. Specifications.

07 06 617 Embankments Construction

Soil embankments classification. Failure of embankment. Stability of embankment. Treating and protecting the slope of embankment. Compaction of soil embankment. Soil stabilization.

07 06 661 Computer Applications in Transportation Engineering

This course discusses some of the main computer applications used in transportation engineering planning, modeling, and analysis. It focuses on the engineering principles for these models and the practical applications of these applications.

07 06 662 Operations Research and Numerical Methods in Transportation Engineering

This course discusses the statistical analysis in transportation engineering including sampling, statistical tests, principles of operations research and numerical applications in data collection and analysis.

07 06 711 Construction & Maintenance of Flexible Pavements

This course discusses the design of flexible pavements starting with the types of subgrade materials, traffic, wheel loads, stresses in pavement layers, and design methods. It also focuses on the main modes of pavement deterioration and maintenance of difference pavement layers.

07 06 712 Pavement Management Systems

This course discusses the main concepts of road condition evaluation and pavement management systems. This includes pavement condition evaluation, database analysis, periodic evaluation of performance, maintenance and rehabilitation analysis, budget optimization and feedback analysis.



07 06 713 Roadway Economics

This course discusses the main concepts of engineering economics, with particular focus on highway construction and maintenance short term and long term economic impacts. This includes emphasizing the economic aspects of the highway engineering projects, including the concepts of the time value of money, present worth, and equivalent annual worth comparisons, rates of return, inflation, and cost benefit analysis.

07 06 714 Roadway Planning & Geometric Design

This course discusses roadway intersections both at-grade and grade separated. This includes the intersections approaches, safety, and efficiency of the intersection, vertical and horizontal alignment of the intersections.

07 06 715 Laboratory Applications

This course discusses laboratory testing applications concerning all aspects of highway construction and maintenance. This includes the engineering background for each test, the engineering requirements for each tests, and the quality of the engineering materials based on the laboratory testing requirements.

07 06 716 Superior Performance Asphalt Pavements (Super pave)

Consensus properties. Gradation of material. Specification of bitumen. Bitumen classification. Compaction and volumetric design. Super pave gyratory compactor (SGC). Super pave performance tests (permanent- deformation- fatigue cracking, etc.).

07 06 811 Rigid Pavement Design

This course discusses the design of rigid pavements starting with the types of materials, traffic, wheel loads, stresses in pavement layers, and design methods. It also focuses on the main modes of pavement deterioration and maintenance of difference pavement layers and pavement joints.

07 06 812 Soil Mechanics for Roads & Airports

This course discusses main requirements for soil mechanics related to highway engineering including types of subgrade materials, soil classifications, soil compaction, soil strength, and drainage studies.

07 06 813 Flexible & Rigid Pavement Design for Airports

This course discusses the design of flexible rigid pavements for airports including the stress distribution, various methods for design, joints and maintenance.

07 06 631 Introduction to Astronomy

Definitions of Astronomy- Definition and detailed geometry of the celestial sphere- Coordinate systems to determine positions of heavenly bodies on the celestial spheres-



Determination of local time and the error of chronometer- Determination of the true meridian (Azimuth)- Determination of Latitude- Determination of Longitude.

07 06 632 Introduction to Geodesy

History of Geodesy and geodetic measurements – Geodesy relationship with other disciplines- Basic concepts – Geodetic Surveying usage – Surveying branches – Ground surveying history within Egypt.

07 06 633 Higher Geodesy

Earth shape. Geoid. Spheroid. Meridian arcs. Latitude and longitude. Azimuth. Radius of curvature in meridional plane. Radius of curvature perpendicular to meridian. Latitude and longitude arc lengths. Areas between longitudes and latitudes. Spheroid calculations. Spheroid Curves. Computation of geodetic position on the reference ellipsoid. The Gauss Mid –Latitude formula. Puissant’s formula for short lines (direct and inverse problems).

07 06 634 Analysis & Adjustment of Surveying Measurements

Types and sources of error. Error propagation and linearization. Theory of Least Squares. Adjustment using Least Squares. Surveying measurements reanalysis. Least Squares: general form. Applications in plane metric coordinate system. Adjustment using matrices.

07 06 663 Technical Studies in Transportation Engineering

Introduction to the basic concepts in applying GPS and GTS in transportation engineering. Technical studies for site investigation and preparation. Technical studies of projects implementation.

07 06 731 Map Projection

Introduction to mapping. Classification of map projection. Projections of a sphere onto a plane. Theory of distortions. Conformal map projection. Equivalent map projection. Equidistant map projection. Cylindrical map projection. Conical map projection. Azimuthal map projection. Mercator map projection. Transverse Mercator projection. Lambert conformal conical projection. Stereographic projection. Computations on a conformal Map Projection Plane.

07 06 732 Adjustment of Geodetic Network

Types of Geodetic networks. Adjustment Triangulation network. Adjustment of trilateration networks. Adjustment of hybrid networks. Adjustment of precise leveling networks. Adjustment of higher networks. Adjustment of the system traverses of a survey network.



07 06 733 Global Positioning System (GPS)

Introduction-GPS segments - GPS signal structure- GPS errors – Geometric Implications- Dilution of Precision (DOP)- Mask Angle- GPS Positioning (Pseudo ranging – Carrier phase ranging)- Phase differencing Techniques - GPS Modernization- GPS Surveying (single point concept, static, rapid static, pseudo static, kinematics, stop and go) – real time kinematics RTK-
Surveying using GPS- GPS calculations and data processing- GPS applications.

07 06 734 Photogrammetry

Introduction- Basics of optics as applied to photogrammetry- Photogrammetric cameras- Photogrammetric measurements- Stereoscopic view- Control points in Photogrammetry- Aerial mosaic- Flight plan- Tilted photos- Stereoscopic equipment.

07 06 735 Hydrographic Surveying

Introduction – Methods of surveying- Horizontal and vertical control – Distance measurement in the sea – Angle measurement- Shore line survey – Tidal gauges – Datum or mean sea level – Soundings- Methods of location of sounding – Hydrographic charts- Production and predication of tides – Gauging of discharge- Measurements of velocity of flow – Determination of discharge of a stream.

07 06 736 Introduction to Geomatics

Overview of the Geomatics Engineering Technology. Introduction to Field Survey Techniques. Introduction to Digital Image Processing. Introduction to Basic Principles of Geographic Information Technologies. Mapping in Geomatics. Applications of Geomatics Technologies.

07 06 737 Cartography & Digital Mapping Systems

Introduction – Methods of surveying- Horizontal and vertical control – Distance measurement in the sea – Angle measurement- Shore line survey – Tidal gauges – Datum or mean sea level – Soundings- Methods of location of sounding – Hydrographic charts- Production and predication of tides – Gauging of discharge- Measurements of velocity of flow – Determination of discharge of a stream.

07 06 738 Geographic Information System (GIS)

Introduction to GIS- Spatial Information Management systems- Data input quality and verification- Spatial digital data representation- Modeling techniques and their applications in GIS- Data processing and analysis- Introduction to data base management systems- Applications of the data base in digital mapping- Different application of GIS - Data output and presentation- Review of the existing GIS software modules- Review of the current status of digital mapping/GIS in Egypt.



07 06 831 Physical Geodesy

Introduction: concept of physical geodesy- Studies of the latest developments in physical geodesy- Gravitational law- Laplace's equation - Boundary value problems- Gravity field - Normal field and anomalous field of the earth- Gravitational methods in geodesy - The inertial principle- Instruments used in conjunction with these concepts.

07 06 832 Photo-Interpretation and Remote Sensing

Basic characteristic of photo images- Basic elements in photographic interpretation- Determination of photo coordinates- Application of photo interpretation- Idealized Remote Sensing system- Remote Sensing from space- Digital Images- Image classification- Remote Sensing application.

07 06 833 Spatial Analysis & Modeling in GIS

Introduction to GEO-Information system. Spatial information management system. Data input, quality and verification. Spatial digital data representation. Modeling techniques and their applications in GIS. Data processing and analysis. Introduction to spatial database management systems. Application of the spatial database in digital mapping/GIS. Different application of GIS as 3D Modeling. Data output and presentation. Review of the existing GIS software modules. Review of the current status of digital mapping/GIS in Egypt.

07 06 834 GPS-GIS Integration for Transportation Applications

Introduction- GPS. Introduction- GIS, GPS-GIS Integration Principles. Errors and Error Modeling in GPS-GIS Integration. GPS-GIS Integration & Transportation Applications.

07 06 865 Advanced Topics in Geodetic/Geomatics Surveying

Size and Shape of Ellipsoidal Shapes. Equations. Parameters Definitions. Cartesian vs Geodetic Coordinate Systems. Meridian Coordinates. Longitudes in Geodesy. Curvature radius.

07 06 866 Leveling and Quantity Surveying

Datums. Levels. Leveling Calculations. Height of Instrument Method. Rise & Fall Method. 2 Pegs Test. Areas. Trapezoidal Methods. Regular Shapes. Area Using the Coordinates Method. Cross-Section Area Calculations. Contour Lines. Volume Calculations.

07 06 641 Breakwaters

To impart a sound understanding of the types and the principles of breakwater as a structure used to solve the problems in Coastal and Port Engineering and introduce the theoretical basics for hydraulic and structural design of the emerged rubble mound breakwaters.



07 06 642 Coastal Defense Structures (A)

To import a sound understanding of the types and the principles of breakwater as a structure used to solve the erosion and accretion problems in Coastal and Port Engineering. And introduce the theoretical basics for hydraulic and structural design of the detached breakwaters, import the knowledge in offshore platforms (Types, construction methods, components behavior and conceptual design) and to provide in details the construction methodology for piles platforms, determination of wave, current and berthing forces acting on piles and deck, studying dynamic behavior for piles and decks, design criteria for plat forms, near shore platforms.

07 06 643 Stability of Shoreline

To provide a good understanding of coastal process, and sediment transport phenomena and its effect on shore line morphology. Introduce the empirical formula to estimate the transported sediment budget, provide the understanding of current induced waves, sediment transport process, shoreline stability, stability of coastal zone, types of coastal protection structures, environmental protection structures.

07 06 644 Design and Construction of Rigid Quay-walls (A)

To provide a good understanding of rigid quay wall types, usage in harbors, and its design criteria's. Introduce and calculate the different design loads and discuss with practical examples the design procedures for precast plain concrete blocks quay walls.

07 06 645 Harbor Hydraulics (A)

To import an understanding and appreciation of the principles, theories and concepts of applied Harbor hydraulics, and develop a basic competence in practical applications of the same theories. Derive the governing equations for the wave motions and its transformations in coastal zone and harbors basins according to the Linear Wave Theory (Airy Theory).

To provide the understanding of wave transformation ,wave breaking , energy dissipation, current induced waves, breakwaters and waves interaction, wave diffraction, water circulation in harbors, tidal current, wave surge ,near shore currents, harbor entrance and waves, wave impact and wave forces.

07 06 646 Design and construction of flexible quay walls (A)



To provide a good understanding of flexible quay wall types, usage in harbors, and its design criteria's. Introduce and calculate the different design loads and discuss with practical examples the design procedures for cantilever and back anchored sheet piles quay walls.

07 06 647 Port Planning (A)

To provide academic training in Port Planning and managements, and provide the understanding of site selection of harbor position, Coastal surveying, soil investigations.

07 06 648 Waves

To import a good understanding of wave prediction wave characteristics, wave mechanics, wave theories, wave transformation, wave diffraction, wave breaking, energy dissipation, current induced waves, wave statistics and spectrum.

07 06 661 Use of Computer in Transportation Engineering (A)

To acquire knowledge and experience in computer programming in the student's field of specialization

07 06 662 Application of Numerical Methods in Transportation Engineering (A)

Provide a good understanding of using numerical methods to solve problems in the student's field of specialization. Study the Finite Difference Method and its applications in transportation engineering.

07 06 741 Coastal Engineering

To import a sound understanding of the types and the principles of breakwater as a structure used to solve the erosion and accretion problems in Coastal and Port Engineering. And introduce the theoretical basics for hydraulic and structural design of the detached breakwaters, groins and revetments, provide a good understanding of near shore hydrodynamics and the related phenomena like currents and sediment transport. And to review the fundamentals behind all types of offshore structures (fixed or floating) and applications of these principles. Understand the design and construction of offshore platforms. Make the use of current, applicable engineering methods in the design of fixed offshore platforms. Introduce the empirical formula to estimate the transported sediment budget and the methods to predict the impact of this phenomenon on the shoreline stability.



07 06 742 Design and construction of flexible quay walls (B)

To provide a good understanding of flexible quay wall types, usage in harbors, and its design criteria's. Introduce and calculate the different design loads and discuss with practical examples the design procedures for cellular sheet pile quay walls.

07 06 743 Port Planning (B)

To introduce proper administrative methods for planning port operations, taking into account the current and futuristic changes for operating seaports, and its reflection on ports situation within regional and international maps. To provide a good understanding of ship repair structures types, usage, hydraulic and structural design of each type including: Dry dock, Slipway, Syncrolift and Floating dock.

07 06 744 Marine Platforms

To review the fundamentals behind all types of offshore structures (fixed or floating) and applications of these principles. Understand the design and construction of offshore platforms. Make the use of current, applicable engineering methods in the design of fixed offshore platforms.

07 06 745 Soil mechanics for Harbor Engineering

To understand the basics of dynamic behavior of soils and foundation and to be able of predicting the response of them due to dynamic loads. To provide the knowledge in earth pressure theories, computing pressures on quay walls, discuss with practical examples for pressure calculations acting on different quay walls with different soil types, selection of quay wall back fill (properties, dimensions and lateral pressure).

07 06 746 Design and construction of rigid quay walls (B)

To provide a good understanding of rigid quay wall types, usage in harbors, and its design criteria's. Introduce and calculate the different design loads and discuss with practical examples the design procedures for precast plain concrete blocks quay walls, counterfort quay walls and caissons quay walls.

07 06 747 Harbor Hydraulic (B)

To import an understanding and appreciation of the principles, theories and concepts of applied Harbor hydraulics, and develop a basic competence in practical applications of the same theories. Derive the governing equations for the wave motions and its transformations in coastal zone and harbors basins according to the Non-Linear Wave Theory (Stock's Theory).

To provide the understanding of Current transformation in harbor basin, forces acting on bollards, hydrodynamics of near shore protection.



07 06 748 Use of Computer in Transportation Engineering (B)

To acquire knowledge and experience in computer programming in the student's field of specialization.

07 06 749 Application of Numerical Methods in Transportation Engineering (B)

Provide a good understanding of using numerical methods to solve problems in the student's field of specialization. Study the Finite Element Method (FEM) and its applications in transportation engineering.

07 06 841 Dynamics of Soils and Foundations

To provide a good understanding of soil dynamics theories and its application on marine structures, studying of earth quake types, forces due to earthquakes, bearing capacity due to earthquakes, liquefactions, pore water pressure, Mononobe -Okabe formulation.

07 06 842 Marine Structure

To provide a good understanding of near shore hydrodynamics and the related phenomena like currents and sediment transport. To introduce an overview the general design principles of a breakwater. Determine of boundary conditions for breakwaters, with special attention to the design frequency. Methods to determine the design wave height from wave statistics. Introduce an overview of other boundary conditions (geotechnical and hydraulic). Study materials, quarries and rock properties. Various properties of the different types of breakwaters, like stability of riprap in current and wave conditions, design of armor layer, natural rock and concrete elements. Study the use of caissons for breakwaters. Introduce a computational method to estimate the element size using classical formulae, partial safety coefficients and probabilistic methods. Prepare the Plan and cross section of breakwaters. Introduce practical examples of breakwaters. Execution (marine or land based equipment) of the works. Failure mechanisms and (cost) optimization. To import a sound understanding of the types and the principles of breakwater as a structure used to solve the erosion and accretion problems in Coastal and Port Engineering. And introduce the theoretical basics for hydraulic and structural design of the submerged breakwaters, groins, floating breakwaters and environmentally friendly breakwaters.

07 06 843 Offshore Structures

To introduce to oenological phenomena that may lead to damages of offshore structures or to prevent their normal functioning. Wind and wind data for design of offshore structures. Mathematical formulation of wind generated sea waves and methods for long- and short-term predictions of their extreme values. Describe of sea currents, ice, corrosion and marine fouling and their influence on design of offshore structures.



07 06 844 Harbor Hydraulic (C)

To impart an understanding and appreciation of the principles, theories and concepts of applied Harbor hydraulics, and develop a basic competence in practical applications of the same theories. Derive the governing equations for the wave motions and its transformations in coastal zone and harbors basins according to Cnoidal and solitary Wave Theories. Introduce and develop the numerical models to predict the wave transformations according to the different wave theories.

07 06 845 Use of Computer in Transportation Engineering (C)

To acquire knowledge and experience in computer programming in the student's field of specialization.

07 06 846 Application of Numerical Methods in Transportation Engineering (C)

Provide a good understanding of using numerical methods to solve problems in the student's field of specialization. Study the Finite Volume Method (FVM) and its applications in transportation engineering. To provide a good understanding of coastal process, and sediment transport phenomena and its effect on shore line morphology. Introduce the Numerical models to estimate the transported sediment budget and the methods to predict the impact of this phenomenon on the shoreline stability. Introduce and calculate the different design loads for flexible quay walls and discuss with practical examples the design procedures for double wall sheet pile quay walls by numerical methods.

07 06 621 Railway Dynamics

Train traction. Forces acting during train motion. Running resistance. Resistance in tunnels. Curve resistance. Acceleration resistance. Gradient resistance. Starting resistance. Train acceleration and deceleration. Train braking. Line scheduling. Coupling of buffers. Tilting trains. Railway simulation.

07 06 622 Geometric Design of Railways

Longitudinal and cross sections. Planning elements. Train movements and horizontal curves. Theoretical and practical values and limits of super-elevation. Combining maximum and minimum speed for super-elevation calculations. Transition curves. Ramps. Compound and reverse curves. Gradients. Vertical curves. Layout design using computer methods. Rail-road crossing and control. Switches and crossing. Manual and automatic switch operation.

07 06 623 Environmental Impacts of Railway Systems

Energy Consumption by railway systems. Air pollution. Prediction Models. Measure to control air pollution. Noise pollution. Sources of railway noise. Factor affecting.



Prediction models. American method. German method. Countermeasure to control railway noise. Noise barrier.

07 06 624 Railway Track System

The track system. Forces generated by train movement. Static and dynamic analysis. Sub-grade. The rail. The sleepers. Fastenings. Ballast. Mechanical behavior of track. Rail welding. Continuous welded rail.

07 06 625 Railway Signaling and Interlocking

Type of signals. Mechanical signaling system. Electro-Mechanical signaling system. Remote control system. Fixed block system. Moving block system. Semi-automatic control system. Automatic system. Centralized traffic control system.

07 06 626 Urban Railways

Introduction to railway transit systems. Railway transit systems (street cars, rapid rail system, regional and subway systems). Planning requirements for different city railway transport systems (cross sections, track alignments, speed, gradient, super-elevation, stations, signaling and control systems). Integration and rationalization of urban transport systems. Example of urban rail transport systems.

07 06 627 Railway Construction, 3 Lec.,

Track technology, Time plan of track construction, Methods of track construction, Track construction machines, Subgrade works, Track drainage, Ballast Works, Tie works, Rail line construction, Correction of track (in horizontal and vertical plan), Rail Welding.

07 06 628 Track Inspection and Maintenance , 3 Lec.,

Parameters influencing track maintenance, Track defects, Track defects recording methods, Limit value of track defects, Progress of track defects, Mechanical equipment for maintenance works, Scheduling of maintenance operations, Technical consideration for track maintenance works, Weed control.

07 06 629 Underground Rail Transport systems, 3 Lec.,

Characteristics of subway transit system, Slab track design, Operation and control systems, Performance characteristics, Rolling stock, Track construction, Track facilities, Operating and Capital costs.

07 06 721 Track Maintenance and Renewal

Classification of maintenance. Daily maintenance. Periodical maintenance. Track inspection. Manual maintenance. Mechanical maintenance. Rehabilitation. Wear of rail. Defects of rail surfaces. Wear of sleepers. Maintenance of rail joints. Insulated track.



Adjustment of track gauge. Manual tamping. Ballast. Checking of rail gaps. Lubrication of rail fastenings bolts. Inspection and maintenance of turnouts and crossings.

07 06 722 Railway Stations and Yards

Type of stations. Planning elements of stations. Wayside. Junction and End stations. Requirements of railway stations for passenger and freight transport. Infrastructure of passenger and freight stations. Passenger and freight yards. Multi-modal container terminal. Marshaling yards. Locomotive yards.

07 06 723 Track Capacity

Introduction. Track capacity. Intersection capacity. Scheduling and timetable. Network analysis. Line and network simulation. Computer applications

07 06 724 Railway Transportation Economics

Railway transit systems. Railway inter-city systems. Railway Transport system components (transit, inter-city). Railway infrastructure.

07 06 725 Railway Infrastructure Design

Passenger stations. Platform. Stairs. Ramps. Passenger tunnels. Level crossing. Multi-transfer stations. Track junction. Subway infrastructure. Signal planning. Freight stations. Classification yards. Locomotive yards. Container terminals.

07 06 726 Railway Planning Using Micro-Computer, 4 lab.

Site Investigation, Screening contour and surveying maps, Types of railway planning maps, Planning of railway lines and network (contour maps, longitudinal planning, cross sections, fastenings and track junctions, stations and yards, signals and interlocking), Track element quantities, Container terminal, Freight Stations.

07 06 727 Railway Construction Specifications, 3 Lec.,

UIC specification, ENR specification, Subgrade specifications, Ballast specifications, Sleeper specifications, Rail and Fastening specifications, Specifications for Welding and distressing, Signal specifications, Platform and station specifications.

07 06 728 Permanent Way Technique, 4 Lec., E.C.-.

Components of permanent way, Ballasted track, Slab track, Geo-technical analysis of subgrade, Dynamic analysis of subgrade, Curing of subgrade (additives, geotextiles), Geo-technical characteristics of Ballast, Mechanical behavior of ballast, Ballast dimensioning, Laying of track, Mechanical equipment, Sequence of construction of various track works.

07 06 729 Regional Rail and Light rail Transport systems, 3 Lec., E.C. -.



Characteristics of regional rail transit, regional rail permanent-way, Operation and control systems, Performance characteristics, Rolling stock, Track construction, Track facilities, Operating and Capital costs. Characteristics of light rail transit, Light rail permanent-way, Operation of light rail transit and control systems, Performance characteristics, Rolling stock, Light rail construction and operating costs, Light rail transit facilities.

07 06 821 Railway Operation

Railway signals. Operation of signals. Mechanical operations. Electro-mechanical operation. Remote control operation. Train control systems. Traffic safety. Interlocking. Track and intersection capacity. Optimization of train operation at stations. Scheduling and time table. Network analysis. Line and network simulation. Computer applications.

07 06 822 Railway Freight Transport System

Role of freight transport. Types of freight. Transport chain. Type of freight trains. Freight transport planning process. Classification yards. Containerization. ISO container. Container transport. Inland container terminal. Handling systems. Handling equipment. Storage facilities. Just in time freight transport system.

07 06 823 Advanced Railway Control Systems

Types of technology applied for control systems. Centralized traffic control centers. Computerized electronic interlocking. Communication systems for railway. Automatic railway control systems. Subway control systems. Problems of railway control systems. Railway control system in Egypt. Magnetic trains.

07 06 824 Railway Simulation

Objectives of simulations. Model and systems of simulations (model building for economic and technical systems). Statistical evaluation. Application of simulation technique in railway. Movement performance simulation. Track simulation.

07 06 825 Multi-Modal Transport Systems

Freight transport systems, Freight types, Economic transport distances, Iso Container. Transport chain, Handling equipments, Handling systems, Choise of handling systems, Demand prediction, Inland container terminal, planning and design.

07 06 826 Magnetic Train Technology,3 Lec.,

MAGLEV systems, Suspension systems, Propulsion systems, Guidance systems, Overview of system concepts (Transrapid 07, Japanese Maglev), Assessment of MAGLEV technology, The potential for Maglev applications, Comparison of Maglev and high speed rail systems, Option for acquiring Maglev.

07 06 827 Railway Planning for High Speed Systems, 3 Lec.



Track types, slab track, Ballasted track, Curve planning (Planning elements, Theoretical and practical values of super-elevation, Transitions Curves, Ramps, Gradients, Vertical alignment), Track junction specifications, Control systems.

07 06 651 Public Transport

Introduction (role of public transport). Public transport systems (characteristics and planning of bus, tram, rapid transit, regional and inter-regional railways). Planning and operation (data collection and analysis, urban, rural, inter-city public transport planning, network planning, route planning, headway and scheduling, timetable creation). General planning concepts (system economics, system financing, transit fare, environmental consideration, planning policies).

07 06 652 Transport Modeling

Methods of demand forecasting (trends and extrapolation, category analysis, econometric models, land use models, gravity models). Travel demand models. Trip generation models. Trip distribution models. Mode choice models. Trip assignment models. Application of models (intercity, urban, international, regional). Calibration of demand models (multiple regression, error analysis).

07 06 653 Transportation Feasibility Studies

Transport financial analysis (expenditure, revenues, subsidies, taxes). Transport cost analysis (project cost items, capital and maintenance costs, cost allocation). Transport operating costs (distance-related costs, time-related costs, vehicle cost, fuel consumption, motor oil consumption, vehicle maintenance, tire consumption, depreciation, crew, overhead costs). Tariff analysis (price analysis process, discount rate, shadow prices, utility of income, practical and social aspects). Transport economic analysis (net present value, benefit-cost ratio, internal rate of return). Overall evaluation of transportation plans.

07 06 751 Freight Transport

Introduction (role of freight transport, transport chain). Modal characteristics (rail, road, water, air cargo, pipelines, belt conveyors). Handling equipment (classification, characteristics, capacities, planning). Storage facilities (classification, characteristics, planning). Container transport (containerization, classifications, carriers, handling equipment, stacking, system planning and economy, modal interface, container terminal planning). Freight transport planning process (data collection and analysis, transport policies, planning goals, demand forecast, modal split and assignment).

07 06 752 Traffic Engineering

Traffic surveys and analysis (traffic flow between and at intersection, speeds and delays, parking). Traffic characteristics (definitions, capacity, service levels, fundamental



relationships). Design of traffic facilities (predicting demands, route classification, geometric design, facilities at intersection, parking facilities, pedestrian and bicycle facilities, network design). Traffic control systems (signs, signals, cycle time calculations, parking control system, area traffic control, integrated traffic control systems for public transport on public roads). Traffic safety (accidents, accident danger, measures for traffic safety).

07 06 753 Transport Planning

Introduction (transportation problems, trends in transportation planning). Urban transportation planning (elements of transportation planning, transportation planning process, goods movement planning). Forecast of urban transport demand (data collection and analysis, goals and objectives, aggregate sequential demand models). Sketch planning and project planning (generation, analysis and evaluation of alternative plans, risk and uncertainty).

07 06 754 Transportation Facilities

Plan and design of highway facilities (roadway structure, parking, pedestrian and bicycle facilities). Airport facilities (air side area: “runway configuration, geometry and capacity, taxiway layout, guidance signing, lighting, pavement design”, land side area: “terminal building, vehicular circulation and parking”). Railway facilities (track structure, passenger and freight stations, marshaling yards, container terminals, operating facilities), Water transport facilities (inland waterways, seaport capacity, wharf structures, fenders, navigation aids, transit sheds, container terminals).

07 06 755 Parking Studies

Introduction. Parking generation and supply needs (parking generation, zoning regulation). Parking studies and characteristics (parking inventories, accumulation and duration). Design aspects of parking facilities (basic parking dimensions, parking modules, separating small and large vehicle areas, parking garages). Parking programs.

07 06 851 Transport Economics

Transport financial analysis (expenditure, revenues, subsidies, taxes). Transport cost analysis (project cost items, capital and maintenance costs, cost allocation). Transport operating costs (distance-related costs, time-related costs, vehicle cost, fuel consumption, motor oil consumption, vehicle maintenance, tire consumption, depreciation, crew, overhead costs). Tariff analysis (price analysis process, discount rate, shadow prices, utility of income, practical and social aspects). Transport economic analysis (net present value, benefit-cost ratio, internal rate of return). Overall evaluation of transportation plans.



07 06 852 Environment and Transport

Introduction (definition of transportation impacts). Environmental direct impacts (air pollution, noise, water pollution, accidents). Environmental indirect impacts (land-use changes, land occupation, cultural and social impacts). Environmental impact assessment and allowable standards. Measures for improving the environmental quality (environment oriented planning, traffic control, traffic calming, land-use changes). Sustainable development of transport systems).

07 06 853 Transportation Logistics

Freight transport (road, rail, sea and air: features, development, technology). Warehousing and material handling (loading and unloading facilities, costs, designs, vehicle design, storage). Distribution strategies (networks, collection-distribution systems). Marketing of transport services (concepts and approach in transport sector, location theory).

07 06 854 Transport and City Planning

Introduction (definitive concepts and ideas). Hypothetical land use/transportation systems. Land use potential and traffic generation. Transportation and land use interaction. Growth and distribution of land use potential. Interactive land use and transportation planning. Concepts of city oriented traffic and traffic oriented city. Developing access. Centralization and decentralization. Traffic facilities in central area. Traffic facilities in residential areas. Feasibility and detailed studies. Management of alternative future. Development of project options.

07 06 855 Intelligent Traffic System ITS

The Range of ITS applications. Actuated Signal control and detection. Network optimization. Sensing traffic using virtual detectors. In-vehicle routing and personal route information. Smart car. Commercial routing and delivery. Electronic toll collection. Smart card. Congestion pricing. Dynamic assignment. Traffic enforcement. Bus transit and para-transit. Emerging issues. Use of GPS.

07 06 856 Transportation Systems and Modes

Introduction. Transportation Systems. Coordinating between transport modes. Road transport (vehicle characteristics, road network, number of lanes and road capacity, parking). Transport stations. Rural and urban transportation planning and management. Rail transport. Air transport. Water transport. Transportation through pipes. Loading/unloading stations and container terminals.

07 06 857 Application of Information Technology in Logistics



Development of trade logistics philosophies. Information technology of trade (electronic commerce. Electronic market. Internet commerce. Electronic data interchange). Transport logistics costs. Organization system. Barriers of trade logistics. Planning of logistics.

07 06 601 Project for the Diploma in Transportation Engineering

07 06 701 Scientific Report for Master of Engineering in Transportation Engineering

07 06 705 Thesis for Master of Science in Transportation Engineering (Highway Engineering)

07 06 706 Thesis for Master of Science in Transportation Engineering (Railway Engineering)

07 06 707 Thesis for Master of Science in Transportation Engineering (Surveying Engineering)

07 06 708 Thesis for Master of Science in Transportation Engineering (Harbor and Coastal Engineering)

07 06 709 Thesis for Master of Science in Transportation Engineering (Transportation Planning and Traffic Engineering)

07 06 801 Dissertation for Ph.D. in Transportation Engineering (Highway Engineering)

07 06 802 Dissertation for Ph.D. in Transportation Engineering (Railway Engineering)

07 06 803 Dissertation for Ph.D. in Transportation Engineering (Surveying Engineering)

07 06 804 Dissertation for Ph.D. in Transportation Engineering (Harbor and Coastal Engineering)

07 06 805 Dissertation for Ph.D. in Transportation Engineering (Transportation Planning and Traffic Engineering)