

## Course Description

### □ Graduate Program

#### **GT500 Introduction to Green Transportation Systems** 3:0:3

This course is mainly to enhance understanding on the transportation and vehicle technology, and the future green transport vehicle technology. We study the overview of sustainable transportation technology including road and railways, aviation, ship, walking and cycling, freight, and ports and airports etc. In addition, the current status and future about the green transport technology, sustainable potential and risk analysis, and policy and its measures will be discussed.

#### **GT501 Electric Propulsion System Engineering** 3:3:4

This course is mainly to enhance understanding on the transportation and vehicle technology, and the future green transport vehicle technology. Focused on the electric powertrain system applied to the public transportation such as bus, railway, ship and airplane etc., we study about the core vehicle technology for the future green and sustainable transportation. The course will includes the experiment and project work.

#### **GT502 Transportation System Analysis and Design** 3:3:4

This course introduces advanced engineering methodologies and their applications to transportation systems. First, statistics, Markov decision process, decision analysis and data mining will be reviewed, and applied to traffic safety, public transportations, operations of terminals, and transportation sustainability. In the second part, It covers tools and methodologies for designing sustainable transportation systems including mass transit, control plans, and IT deployments.

#### **GT505 Structural Design and Analysis for Transportation Systems** 3:3:4

In order to learn computer-aided engineering for structural design and analysis for transportation systems, this course introduces basic principles of computer-aided engineering techniques and exercises simple case studies with commercial software for CAD, Finite Element Analysis, and multi-body dynamic analysis.

#### **GT506 Traffic Signal and Control Systems** 3:0:3

This course introduces the basic concept & operational principle of signal & control systems which are used in automobile & railway. Also, the analysis and design method of signal & control system is explained. In case of automobile, improved real time signal & control, interworking of signal & control systems and traffic adaptive signal & control systems are investigated. Moreover, in case of railway, discontinuous & continuous control schemes are surveyed.

#### **GT507 Transportation Infrastructure systems** 3:0:3

This course provides understanding on transportation-related infrastructures, and deals with planning of infrastructure systems, geometric and structural design, and evaluation of the systems. It covers facilities issues including railway systems, roadway design, pavement management systems, harbor and airport design, and expands to sustainability issues.

#### **GT508 Next Generation Satellite Navigation Systems** 3:0:3

This course introduces principles, orbital mechanics, radio signals, and receiver measurement processing in GPS. In addition, this course provides advanced theoretical and technical analysis of various radio interfaces of next generation GNSS such as modernized GPS, Glonass and Galileo of US, Russia and Europe, respectively, and talks about GNSS application systems for personal navigation, ground, ocean and air transportation.

#### **GT520 Electric Powertrain Engineering** 3:0:3

This course covers the vehicular technology of electric powertrain for the public transportation such as the bus and railways etc., which includes the environmental impact, electric and hybrid-electric, wireless in-motion charging vehicular technology and their systems, and fuel cell technology, in addition to the current IC-engine technology. It will also cover the core technology of the electric vehicle system, such as the energy storage system, the electric

propulsion system and the incorporation of the smart grid technology with the electric vehicle as a major future transportation system.

**GT602 Surface Transportation Vehicle System Design Project** 0:9:3

This course is designed for the Renaissance PhD program students focused on the surface transportation vehicle technology and system. The registered students will perform a design project applying engineering system design approach on the next generation transportation vehicle system, component, sub-system or system-level, through creative discussion and practical application of the engineering practices.

**GT603 Maritime Cargo Transfer System Design Project** 0:9:3

In order to propose conceptual designs for maritime cargo transfer systems which enable ship-to-ship cargo transfer in open sea, this course aims to perform problem definition, functional requirement analysis, design parameter proposal, integration, revision and concretization, and evaluation based on team work. This course is planned to have free discussion for a common topic, Mobile Harbor, with 2 times project presentation.

**GT610 Intelligent Traffic Control and Simulation** 3:0:3

This course deals with systems and methodologies for traffic control using smart technologies, and macroscopic and microscopic traffic simulations for traffic flow analysis and prediction. It also provides transportation system evaluation method using microscopic traffic simulations and methodologies for developing special simulations systems such as on-line electric vehicles.

**GT611 Introduction to Transportation Economics** 3:0:3

Introductory class to transportation economics. Lectures consist of transportation demand and supply models, econometrics approach, planning and policy analysis, applications to contemporary transportation issues. Case studies will be presented and discussed to understand how various approaches in the economics apply for transportation analyses.

**GT620 Introduction to Logistics Planning and Management** 3:0:3

This class introduces the fundamental models and methodologies required to design the green logistics systems and economic analysis of supply chain network. The material is taught from a managerial perspective, with an emphasis on where and how specific tools can be used to improve the overall performance as well as to reduce the total energy consumption using green technology

**GT621 System Engineering on Green Logistics** 3:0:3

This class introduces the green transportation system, energy efficient transportation infrastructure, and IT-information network for green logistics system from system design and operations perspectives. System design techniques and analysis methods are presented for energy efficient transportation systems. The main goal of this subject is to teach analytical methods and to provide insight to design and development of next generation logistics systems.

**GT631 Dynamics and NVH Engineering on Next Generation Surface Transportation Vehicle** 3:0:3

This course is designed to provide understanding on the dynamical characteristics and the source and remedies of the noise and vibration on the future surface transportation vehicles, such as electric vehicles. As a core development process of electric vehicles, the inter-related optimized design, combining the dynamics, noise and vibration and the communication and control system within the electric vehicles, will be covered. The interaction with the charging infrastructure will be covered as well.

**GT640 Green Railway System Engineering** 3:0:3

To ensure that students have a sound understanding of the key issues affecting the planning, construction, operation and management of railway system and of the underlying economic principles including integrating transit into a multi-modal, balanced, comprehensive system, and also technical aspects of rail-based ITS, energy and CO<sub>2</sub> reduction, By doing this, the future transport system and research area including SLRT, HST, MAGLEV and OLEV will be applied.

- GT641 Dynamics and NVH Engineering on Green Railway Vehicle** 3:0:3  
The dynamic characteristics and NVH aspects on railway vehicle will be studied in this course, which is necessary for the future green railways application. The dynamic behavior of railway vehicle is important in safety and high speed limits. Vibration and noise is also important for design optimization and customers' perspective on the vehicle structure and the vehicle-rail interaction.
- GT650 Introduction to Green Ship Technology** 3:0:3  
Green ship technology which encompasses eco-friendly ship design, manufacturing and operation is an emerging area as environmental issues. This course presents green ship technology along with introducing general principles of ship-building and ocean engineering.
- GT651 Green Ship Propulsion System** 3:0:3  
Green ship technology becomes ever more important, which is necessary to protect our environment. This course introduces green ship propulsion systems from the eco-friendly aspect of technologies.
- GT660 Green Air Transportation System and Green Aviation** 3:0:3  
This course is an introductory course to next generation navigation and aviation systems. We study subjects on broad area of green air transportation system such as communication, surveillance, navigation systems.
- GT661 Electronic Navigation Systems** 3:0:3  
This course provides an introduction on various electronic navigation systems and its positioning principles. Especially, this course discusses technical issues in many wireless positioning systems such as A-GPS, UWB based positioning, Indoor GPS and Industry standards
- GT701 Safety Standards and Certification System of the Future Transport System** 3:0:3  
This course is designed to understand and solve certification processes of the future transport system by understanding current safety standards and certification processes of the automobile, train and railway, airplane and airport, ship and seaport. By doing this, the future transport system will be applied to real world in the fast manner.
- GT702 Management of Green Transportation Systems** 3:0:3  
This course introduces the management system for green transportation system which consists of manager, agent, management information base and communication network. Also, we investigate the management functions such as fault, accounting, configuration, performance and security management. Moreover, we study on the management and customer service for vehicle, train, ship and airplane by using IT convergence technology.
- GT712 Traffic Communication System** 3:0:3  
This course introduces intra-vehicle communication, inter vehicle communication and vehicle to infrastructure communication. Also, the wireless access network and transport network for train are explained. Moreover, satellite communication network for ship and airplane is investigated and inter-working among heterogeneous transportation network is suggested.
- GT722 Automation on Green Logistics System** 3:0:3  
This class deals with the various automations systems for green logistics using environmental friendly and energy efficient technologies. New hardware and software required for the green logistics are presented. Mathematical technique and economic analysis for green logistics are also addressed. This is neither a purely theoretical nor a case study course, but rather an analytical course that address real problems found in practices.
- GT732 Development and Mass-Production of Next Generation Surface Transportation** 3:0:3  
With the paradigm shift from the IC-engine operated to the electrified vehicles, manufacturing strategy, planning and process design will be different from the 100-year-old current OEM-based model. Based on the business analysis combined with the future technology trend analysis will be studied in this course. Core components industry shift will also be covered.

- GT742 Green Railway Transit Technology and Infrastructure** 3:0:3  
Beginning with the social needs and economic analysis, including the eco-friendliness, as a public transit, the current and future technology on the railway vehicle and the transit infrastructure will be studied in this course. The nature of nation-wide major infrastructure and public investment for the policy makers decision will be emphasized. We can achieve educating the railway researchers through the technological analysis and modelling on the raid road system.
- GT814 Special Topics in Green Transportation Engineering** 3:0:3  
This course covers various issues in green transportation engineering. Topics include issues in traffic engineering, transportation infrastructure engineering, air transportation systems, transportation, economics and sustainability in transportation systems.
- GT829 Special Topics in Green Logistics** 3:0:3  
This course covers special topics in Green logistics and the specific course contents will be announced before the course offering. This syllabus is designed on the design and analysis of green logistics system, which deals with the analytic tools on the green logistics system integrated with supply chain.
- GT833 Special Topics on Next Generation Surface Vehicle Technology** 3:0:3  
This course is reserved for the selected special topics in the field of next generation surface vehicle technology upon need-basis. The specific contents of this course will be determined before the offering and notified. This syllabus application is for the sub-titled subject of "Automotive Technology Forecast in 2030."
- GT843 Special Topics on Green Railway Vehicle Technology** 3:0:3  
This course is reserved for the selected special topics in the field of green railway vehicle technology upon need-basis. The specific contents of this course will be determined before the offering and notified. This syllabus application is designed for the sub-title, "Current Status and Forecast on Green Railway Vehicle Technology."
- GT859 Special Topics in Green Ocean Transportation** 3:0:3  
This course is reserved for the selected special topics in the field of design and performance assessment for green ocean transportation systems upon need-basis. The specific contents of this course will be determined before the offering and notified. This syllabus application is for the sub-titled subject of "System Development for Offshore Wind Turbine and Green Ship"
- GT869 Special Topics on Next Generation Aviation Transportation System** 3:0:3  
This course is reserved for the selected special topics in the field of next generation aviation transportation system upon need-basis. The specific contents of this course will be determined before the course offering and notified. This syllabus application is for the sub-titled subject of "Forecast of CNS-ATM (Communication, Navigation and Surveillance - Air Traffic Management) Technology in 2030."
- GT960 MS Thesis**  
This is an independent research work supervised by the advisor(s), toward the Master's thesis.
- GT966 MS Seminar** 1:0:1  
This course provides general understanding on green transportation for master student The seminar topics include current technologies, policies and issues on green transportation.
- GT980 Ph.D. Thesis**  
This is an independent research work supervised by the advisor(s), toward the Ph.D's thesis.
- GT986 Ph.D. Seminar** 1:0:1  
This course provides general understanding on green transportation systems for doctoral student The seminar topics include current technologies, policies and issues on green transportation.