



Master of Engineering in Automotive Engineering
(International Program)
(2017 Revision)

Faculty of Engineering
King Mongkut's Institute of Technology Ladkrabang

**Master of Engineering in Automotive Engineering
(International Program)
(2017 Revision)**

Name of Institution King Mongkut's Institute of Technology Ladkrabang
Faculty Engineering

Part 1: General Information

- 1. Program title** : Master of Engineering Program in Automotive Engineering
(International Program)

- 2. Degree and field title**
 - Full name : Master of Engineering (Automotive Engineering)
 - Abbreviation : M.Eng. (Automotive Engineering)

- 3. Major or Minor subjects (if any)**
Major Automotive Engineering (Automotive Engineering)

- 4. Total Credits**
Plan A2 38 credits

- 5. Type of the Program**
 - 5.1 Type**
2 year Master's Degree Program
 - 5.2 Language**
English
 - 5.3 Admission**
Both Thai and Foreign students
 - 5.4 Collaboration with other institutes**
 - 5.4.1 This program is under the collaboration with National Science and Technology Development Agency (NSTDA). NSTDA offers scholarships for students. NSTDA also provides study spaces for students, lecturers, and researchers as well as thesis advisors to study and conduct research.
 - 5.4.2 The program is under collaboration with Tokyo Institute of Technology in Japan and King Mongkut's University of Technology Thonburi. The lecturers from TIT and KMUTT will be co-lecturers and co-advisors.
 - 5.4.3 The program is under collaboration with Tokyo Institute of Technology in Japan, Munich University of the Federal Armed Forces, and Frankfurt University of Applied Sciences in Germany in term of student and staff exchange

5.5. Degree Conferment

One Degree, Master of Engineering in Automotive Engineering from KMITL

6. Status of the Program and Consideration for the Authorization/Agreement

Revised program Course begins on.....August.....2017.....

The program has been endorsed by the Academic Committee of KMITL in its meeting No.2...../.....2017..... on.....21.....February.....2017.....

The program has been endorsed by the KMITL Council in its meeting No.5...../.....2017..... on.....31.....May.....2017.....

7. Expected Date for Thai Qualifications Register (TQR)

Academic Year 2018

8. Career Paths

8.1 Professional Automotive Engineer equipped with excellent perspective in energy and environmental management technology and automotive technology, and be capable of designing, analyzing motor vehicle problems and mending motor vehicles appropriately according to engineering principles.

8.2 Teacher, Instructor, Researcher, or Expert in automotive engineering and related fields.

8.3 Automotive Engineering Entrepreneur

9. Instructor Details

Name-Surname (Academic Position)	Qualification (Field of study), Academic Year	University
1. Asst. Prof. Dr. Chinda Charoenphonphanich (Mechanical Engineering)	- D.Eng. (Mechanical Eng.), 2001. - M.Eng. (Mechanical Eng.), 1994. - B.Eng. (Mechanical Eng.), 1991.	Tokai University, Japan Tokai University, Japan KMITL.
2. Asst. Prof. Dr. Chaiwat Nuthong (Electrical Engineering)	- Dr.Ing. (Control Eng.), 2009. - M.Sc. (Mechatronics), 2004. - B.Eng. (Electrical Eng.), 1997.	Bundeswehr Munchen, Germany University of Siegen, Germany KMITL.
3. Asst. Prof. Dr. Preechar Karin (Mechanical Engineering)	- D.Eng. (Mechanical Eng.), 2010. - M.Eng. (Mechanical Eng.), 2006. - B.Eng. (Mechanical Eng.), 1997.	Tokyo Institute of Technology, Japan KMITL. UBU.

10. Location of Study

10.1 King Mongkut's Institute Technology Ladkrabang

10.2 On the condition of co-conducting research with National Science and Technology Development Agency (NSTDA), Pathum Thani, students must take some courses and conduct research at NSTDA.

11. External Situation or Development Needed to be Considered for the Planning of the Program

11.1 Economic Situation/Development

Currently, the automotive industry is considered as the main industry which invigorates the economy in Thailand. Thus, the sustainable development of the automotive industry will stabilize the economy in long-term planning. Moreover, the 11th Economic and Social Development Plan (B.E. 2555–2559) gave precedence to large-scale manufacturing, environmentally-friendly production and consumption, the stability of energy and food, and to equip individuals with expertise and morality. Therefore, it is necessary to prepare an advanced automotive and rail transportation engineer since they will play a vital role in propelling the country forward with sustainability and being a global leader in the advanced automotive and transportation industry.

11.2 Social and Cultural Situation/Development

Nowadays, Automotive and rail transportation plays an important role in the way of living. The development of automotive technology is now concerned with environmental and social aspects such as reducing the emission of carbon dioxide resulting in global warming, reducing pollution from automobiles causing health and environmental problems, solving energy crisis, concerning with the safety of drivers and pedestrians and so forth. Establishing an energy saving culture and reducing the pollution from automobiles can enhance quality of life. Thus, it is essential to study and conduct research on automotive engineering and related fields focusing on energy and environmental management using appropriate and efficient technology. This process will enable the sustainable development of the country.

12. Effects from 11.1 and 11.2 on the Development of the Program and the Relation to the Mission of the Institute

12.1 Program Development

Automotive engineering program is aimed (1) to produce professional automotive and rail transportation engineers (2) to prepare the competent engineers who play an important role in the automotive engineering industry and enhance the sustainability of the industry in accordance with the 11th National Economic and Social Development Plan. Moreover, it is necessary to broaden the development of technology for the future concerning energy, environment, community, and culture, resulting in sustainable social development.

12.2 Relation to the Mission of the Institute

Automotive engineering program is in English program, so this program is suitable for Thai and foreign students who are seeking to develop their science and technology knowledge in the aspect of automotive and rail transportation which is the primary issue in Asia. The development of the program is associated with the mission and vision of the institute aimed to develop the scientific and technology research and to equip graduates with the science and technology knowledge, according to the international standard.

13. Relation (if any) with Other Programs Open in the Faculty / Other Departments of the Institute(i.e. Subjects Open for the Service of Other Faculties / Departments or to Be Studied with Other Faculties / Departments)

13.1 Subjects / Subject Groups in the Program Open by Other Faculties / Departments / Programs

Free Elective Courses offered by International College, KMITL (Any course no. beginning with 13)

13.2 Subjects / Subject Groups in the Program Open and Required to be Studied by Other Faculties / Departments / Programs

None

Curriculum

Curriculum, specify the details as follows

Total Credits

Plan A2	<u>38</u>	credits
A. Thesis Course	12	credits
B. Seminar Course	2	credits
C. Required Course	12	credits
D. Elective Course	12	credits

Subject in the curriculum

Thesis Course		12 credits
		Credits (Lecture-Practice-Self-study)
13037303 THESIS		12 (0-36-0)

Required Course		12 credits
Required Course (Automotive Engineering)		9 credits
		Credits (Lecture-Practice-Self-study)
13037001 FUNDAMENTAL OF AUTOMOTIVE ENGINEERING		3 (3-0-6)
13037002 BASICS OF AUTOMOTIVE DESIGN		3 (3-0-6)
13037003 PRACTICE OF AUTOMOTIVE DESIGN		3 (2-1-5)

Required Course (Mathematics)		3 credits
		Credits (Lecture-Practice-Self-study)
13037004 DECISION MAKING AND OPTIMIZATION		3 (3-0-6)
13037005 NUMERICAL METHODS FOR ENGINEERING		3 (3-0-6)
13037006 COMPUTATIONAL MATHEMATICS		3 (3-0-6)
13037007 ADVANCED ENGINEERING MATHEMATICS		3 (3-0-6)

Elective Course		12 credits
		Credits (Lecture-Practice-Self-study)
13037101 AUTOMOTIVE STRUCTURAL SYSTEM ENGINEERING		3 (3-0-6)
13037102 AUTOMOTIVE COMFORT MECHANICS ENGINEERING		3 (3-0-6)
13037103 COMBUSTION ENGINEERING		3 (3-0-6)
13037104 ADVANCED INTERNAL COMBUSTION		3 (3-0-6)
		ENGINE ENGINEERING AND FUTURE POWER TRAIN
13037105 ADVANCED PRODUCTION ENGINEERING		3 (3-0-6)
13037106 ALTERNATIVE VEHICLE PROPULSION SYSTEMS		3 (3-0-6)
13037107 VEHICLE ACOUSTICS		3 (3-0-6)
13037108 MECHATRONIC SYSTEMS IN AUTOMOTIVE ENGINEERING		3 (3-0-6)
13037109 CURRENT TOPICS IN AUTOMOTIVE ENGINEERING		3 (3-0-6)
13037110 ADVANCED TOPICS IN AUTOMOTIVE ENGINEERING		3 (3-0-6)

Course Description

Required Course 12 credits

Required Course (Automotive Engineering) 9 credits

13037001 FUNDAMENTAL OF AUTOMOTIVE ENGINEERING 3 (3-0-6)

PREREQUISITE: NONE

Introduction to automotive engineering systems and ground vehicle design: Engine type and parts; Power train; Body and chassis; Automotive electrical system; Transmission systems; Suspension systems; Steering systems; Tire and wheel; Handling; Maintenance, troubleshooting and repairs; and Alternative fuel engine. Automotive industry standard software for examining various design parameters influencing vehicle performance and handling.

13037002 BASICS OF AUTOMOTIVE DESIGN 3 (3-0-6)

PREREQUISITE: NONE

Basics of Computer Aided Design (CAD): Overview of CAD; Theory of curved line and curved surface; Theory of mesh generation; and theory of reverse engineering.

Basic of Computer Aided Engineering (CAE): Overview of CAE; Technology for analysis; Finite Element Method; Boundary Element Method; Optimization analysis; and Application examples.

CAE model: Generation of CAE model from CAD; Generation of CAE model from measured data; Generation of CAE model from experiments; and Identification of CAE model.

13037003 PRACTICE OF AUTOMOTIVE DESIGN 3 (2-1-5)

PREREQUISITE: NONE

Design of SAE-Formula Car: Planning of vehicle, Harmonization of performance and components; Concept of frame structures; Analysis of strength and stiffness with CAD/CAE.

Analysis of SAE-formula car: Tuning of engine performance and gear ratio; Braking effort and brake-lock; Performance of circling movements and maneuverability.

Assembly and disassembly of engine and beam model: Disassembly of engine and measurement of components; Assembly of engine; Assembly of miniature beam model for frame structure; and Measurement of beam model.

Required Course (Mathematics)

3 credits

13037004 DECISION MAKING AND OPTIMIZATION

3 (3-0-6)

PREREQUISITE: NONE

Fundamental optimization tools for quantitative analysis to develop modeling and decision-making skill in management sciences. Linear programming. Integer programming. Nonlinear programming. Goal programming. Game theory. Markov chains. Queuing theory and decision analysis techniques. Advanced topics in optimization.

13037005 NUMERICAL METHODS FOR ENGINEERING

3 (3-0-6)

PREREQUISITE: NONE

Programming concepts and techniques. Modern programming languages and computational tools for engineering problems. Numerical methods as applied to practical engineering problems. Introduction to finite element methods.

13037006 COMPUTATIONAL MATHEMATICS

3 (3-0-6)

PREREQUISITE: NONE

Set theory. Relations. Formal proof methods. Finite automata. Regular expressions. Context-free grammar. Push down automata. First order logic. Theories related to counting, graphs and networks. Interplay between continuous models and their solution via discrete processes. Vector spaces, basis, dimension, eigenvalue problems, diagonalization, inner products, unitary matrices. Introduction to applied statistics and its application to intelligent systems. Introduction to supervised statistical learning including discrimination methods.

13037007 ADVANCED ENGINEERING MATHEMATICS

3 (3-0-6)

PREREQUISITE: NONE

Mathematics for solving engineering problems. Ordinary differential equations of higher order. Partial differential equations. Integral equations. Numerical analysis. Optimization techniques.

Elective Course

12 credits

13037101 AUTOMOTIVE STRUCTURAL SYSTEM ENGINEERING

3 (3-0-6)

PREREQUISITE: NONE

Overview on vehicle and rail transportation system research and development: Vehicle planning and design; Process from advanced research to marketing; Past and the future prospect. Vehicle and electric train components: Propulsion; Engine; Body; and Suspension. Vehicle and electric train characteristics: Performance of man-machine-environment system; Active safety and passive safety. Suspension and drive-train systems: Suspension system; Steering system; Tire and its interaction with road surface; Braking system; Friction and tribology; Drive-train; Stability and maneuverability analysis; and Advanced control system.

Mechanics of thin-walled structures for automobiles and electric train: Concept of stiffness and strength for automotive and electric train structures; Fundamentals of solid mechanics; Deformations of tension; Compression and torsion; Measurement of structural deformation; Theory of thin plates; Theory of monocoque structures; Theory of structural collision and concept of impact energy absorption

13037102 AUTOMOTIVE COMFORT MECHANICS ENGINEERING

3 (3-0-6)

PREREQUISITE: NONE

Electronics and control engineering: Introduction of electronics and control in automobiles and rail transportation system; Electric control of engines and transmission; Electronics in operation monitoring; Electric control in braking systems; and Electric control systems for automotive and electric train mobility and safety.

Aerodynamics and air conditioning: Fundamentals of fluid-dynamics; Computational fluid dynamics (CFD); Aerodynamics in vehicles and bogies; Thermodynamics in air-conditioners and air-conditioning systems in vehicles and electric train.

Vibration and noise engineering: Introduction of automotive and railway electric train vibration and noise problems; Measurement and data processing for vibration and noise; Modeling for vibration and noise analysis and comfortability; Numerical simulation of vibration and noise; and Structural design and technology for vibration and noise reduction

13037103 COMBUSTION ENGINEERING 3 (3-0-6)

PREREQUISITE: NONE

Fundamentals of combustion: Reactive gas dynamics (laminar and turbulent flames); Ignition and extinction; Reaction kinetics and simulation.

Thermodynamics in internal combustion engines: first and second laws of thermodynamics in internal combustion engines; Gas cycles of internal combustion engines; Thermodynamic analysis of heat release rate in internal combustion engines.

Combustion technologies in internal combustion engines: Combustion technologies in spark ignition engine; Combustion technologies in compression ignition engine; and Combustion technologies for high efficiency and clean exhaust gas.

13037104 ADVANCED INTERNAL COMBUSTION ENGINE 3 (3-0-6)

ENGINEERING AND FUTURE POWER TRAIN

PREREQUISITE: NONE

Flow and combustion diagnostics in IC engines: Flow diagnostics in IC engines; and Combustion diagnostics in IC engines.

Zero emission technologies: Production and control of NO_x; Production and control of particulate matters; and Advanced zero emission technologies.

Future power train for sustainable community: Energy consumption and environmental protection; Future energy systems for sustainability; Present status and future prospect of sustainable mobility; Battery electrical vehicle and; Hybrid vehicle; Fuel cell vehicle; and Rail transport application.

13037105 ADVANCED PRODUCTION ENGINEERING 3 (3-0-6)

PREREQUISITE: NONE

Fundamentals of production technology: Production processes for automotive engineering; Integrated and intelligent manufacturing system; Structure and function of machine tools; Computer numerical control (CNC) of machine tools; and Practical training of CAD/CAM and CNC machine tools.

Welding and joining technologies: Physics and basic engineering in welding and joining; Welding and joining processes; Equipment for welding and joining; Behavior of materials in welding and joining; Design and construction of joints; Analyses of joints; and Examples of welding and joining process.

13037112 MOTOR AND ELECTRICAL CONTROL IN AUTOMOTIVE 3 (3-0-6)
APPLICATIONS

PREREQUISITE: NONE

The basic concepts of electrical drive systems: Modeling of DC and AC machines; Open-loop and closed-loop control of electric drives; Constant volt/hertz and constant flux control with voltage source and current source; Vector control of AC drives; Example in Automotive applications.

13037113 COMPUTATIONAL INTELLIGENCE IN AUTOMOTIVE 3 (3-0-6)
APPLICATIONS

PREREQUISITE: NONE

The various computational intelligence for automotive fields: Introduction to computational intelligence; Neural networks; Fuzzy logic; Swarm intelligence and evolutionary computation; Examples in automotive applications.

13037114 METAL FORMING ENGINEERING AND METAL DIE DESIGN 3 (3-0-6)
PREREQUISITE: NONE

Fundamental and techniques of metal forming die design and process parameters. Determinations of stresses, force, work, power, and efficiency on metal forming and mathematical analysis of die components in order to be used in the design of product. Metal Forming Machine Tools: Description of rolling mills; Hammers; and Presses.

Tribology: Friction in deformation processes; Lubricating mechanisms; Wear; Lubricants; and Friction measurement in metal forming.

13037115 ADVANCED MATERIAL SCIENCE AND ENGINEERING 3 (3-0-6)
PREREQUISITE: NONE

The fundamental thermodynamic laws for materials science: Materials behave under various circumstances. Non-equilibrium phenomena like phase transformation and solidification: Atomic diffusion; Diffusion less phenomena. Physical metallurgy: Structures and morphology, Thermal properties, Corrosion resistance, Electrical and Magnetic properties.

Fracture mechanics: Controlling fatigue and fracture of crystalline and amorphous solids. The study electron optics: Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM). Computational methods: Phenomena in Materials science.

Seminar Course **2 credits**

13037201 SEMINARS IN AUTOMOTIVE ENGINEERING **2 (0-4-0)**

PREREQUISITE: NONE

A seminar in which the students must study some specific topics, make a presentation and discussion.

Thesis Course **12 credits**

13037303 THESIS **12 (0-36-0)**

PREREQUISITE: NONE

This course provides an opportunity for a student to do research under the supervision of his/her advisor. The research emphasizes a case study with the aim of the effectiveness in telecommunications management.

The experimental research is to solve problems and make the succession in the topic related to the field of master study under the supervision of the advisor. The complete thesis must be proposed to the department and library. The final exam will include an oral defense of a thesis. Registration will be required according to the regulations toward completion of the thesis.