MASTER OF SCIENCE (AUTOMOTIVE ENGINEERING)

PROGRAMME SPECIFICATION

The Master of Science (Automotive Engineering) programme aims to provide graduates with the advanced knowledge and capabilities to carry out research and solve complex automotive engineering problems effectively. Upon the graduation, graduates may improve the knowledge related to Vehicle powertrain, chassis, styling, and vehicle dynamics. Graduates may also expose to vehicle control engineering, hybrid technology, tribology and braking system. The versatility of this program allows graduates a variety of career options

The Master of Science (Automotive Engineering) is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at various learning centres throughout Malaysia. The normal full-time program can be completed in a minimum of one year, i.e. two long semesters and one short semester. The maximum period for the completion of the full-time program is eight normal semesters (nominally 4 years). The maximum duration allowed for part-time students is also eight normal semesters (nominally 4 years). The full-time student is allowed to take a maximum of 20 credits in a normal semester and 10 credits in a short semester. The part time student is allowed to take a maximum of 12 credits in a normal semester and 6 credits in a short semester. Assessment is based on coursework and final examinations given throughout the semester.

General Information

<table>
<tr><td colspan="3">1. Awarding Institution</td><td colspan="2">Universiti Teknologi Malaysia</td></tr>
<tr><td colspan="3">2. Teaching Institution</td><td colspan="2">Universiti Teknologi Malaysia</td></tr>
<tr><td colspan="3">3. Programme Name</td><td colspan="2">Master of Science (Automotive Engineering)</td></tr>
<tr><td colspan="3">4. Final Award</td><td colspan="2">Master of Science (Automotive Engineering)</td></tr>
<tr><td colspan="3">5. Programme Code</td><td colspan="2">MKMV</td></tr>
<tr><td colspan="3">6. Professional or Statutory Body of Accreditation</td><td colspan="2">Malaysian Qualification Agency, MQA</td></tr>
<tr><td colspan="3">7. Language(s) of Instruction</td><td colspan="2">English</td></tr>
<tr><td colspan="3">8. Mode of Study</td><td colspan="2">Conventional</td></tr>
<tr><td colspan="3">9. Mode of operation</td><td colspan="2">Self-governing</td></tr>
<tr><td colspan="3">10. Study Scheme (Full Time/Part Time)</td><td colspan="2">Full Time / Part Time</td></tr>
<tr><td colspan="3">11. Study Duration</td><td colspan="2">Minimum : 1 year
Maximum : 4 years</td></tr>
<tr><td rowspan="2">Type of Semester</td><td colspan="2">No. of Semesters</td><td colspan="2">No of Weeks/Semester</td></tr>
<tr><td>Full Time</td><td>Part Time</td><td>Full Time</td><td>Part Time</td></tr>
<tr><td>Normal</td><td>8</td><td>8</td><td>14</td><td>14</td></tr>
<tr><td>Short</td><td>4</td><td>4</td><td>8</td><td>8</td></tr>
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Course Classification

Course Category	Code	Course	Credit	Percentage
University General Courses	U### ###3	University Electives	3	7.5%
Programme Core	MKMV1203	Automotive Electronics & Control	3	37.5%
	MKMM 1213	Advanced Engineering Mathematics	3	
	MKMV1803	Quality Engineering	3	
	MKMM 1903	Research Methodology	3	
	MKMV2213	Automotive Noise, Vibration and Harshness	3	
Project	MKMV 1914	Master Project I	4	25%
	MKMV 2926	Master Project II	6	
Programme Electives (choose 4 courses only)	MKMV1213	Vehicle Engineering	3	30%
	MKMV1313	Advanced Vehicle Dynamics	3	
	MKMV1403	Internal Combustion Engines	3	
	MKMV1503	Drivetrain Engineering	3	
	MKMV2223	Automotive Braking System	3	
	MKMV2323	Automotive Aerodynamics	3	
	MKMV2413	Advanced Engine Boosting and Downsizing	3	
	MKMV2513	Automotive Tribology	3	
Total Credit Value			**40**	**100%**

Program Educational Objectives (PEO)

PEO1: Graduates are able to apply the knowledge gained to identify, develop solution and solve problems related to automotive engineering in various situations and contexts, efficiently and effectively.

PEO2: Graduates are able to communicate and present ideas intellectually and effectively.

PEO3: Graduates are able to conduct research, manage and publish information and continue life-long learning

Program Learning Objectives (PLO)

PLO1: Demonstrate the mastery of the advance knowledge in automotive engineering, and have the capabilities to further develop or use these in new situations.

PLO2: Demonstrate research skill in appraising available information and research evidence, and applying them in automotive engineering context

PLO3: Apply critical thinking and problem-solving skills in addressing automotive engineering problems utilizing relevant tools and techniques.

PLO4: Perform research on automotive engineering problems professionally, ethically and responsibly for the benefit of the society.

PLO5: Communicate technical knowledge and ideas effectively in written and oral forms.

PLO6: Adopt the latest relevant knowledge and technologies through life-long learning.

GRADUATION CHECKLIST

Students must pass all the stated courses in this checklist to graduate. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the courses are not allowed to graduate.

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√) IF PASSED
UNIVERSITY GENERAL COURSES					
1	U### ###3	University Course Electives	3	3	
TOTAL CREDIT of UNIVERSITY GENERAL COURSES (a)			3	3	
PROGRAMME CORE COURSES					
1	MKMM 1213	Advanced Engineering Mathematics	3	3	
2	MKMM 1903	Research Methodology	3	3	
3	MKMV1203	Automotive Electronics & Control	3	3	
4	MKMV1803	Quality Engineering	3	3	
5	MKMV2213	Automotive Noise, Vibration and Harshness	3	3	
TOTAL CREDIT OF PROGRAMME CORE COURSES (b)			15	15	
MASTER PROJECT COURSES					
1	MKMV 1914	Master Project I	4	4	
2	MKMV 2926	Master Project II	6	6	
TOTAL CREDIT OF MASTER PROJECT COURSES (c)			10	10	
PROGRAMME ELECTIVES (5 COURSES)					
1	MKMV ###3	Elective 1	3	3	
2	MKMV ###3	Elective 2	3	3	
3	MKMV ###3	Elective 3	3	3	
4	MKMV ###3	Elective 4	3	3	
TOTAL CREDIT OF ELECTIVES COURSES (d)			12	12	
TOTAL CREDIT TO GRADUATE (a + b + c + d)			**40**	**40**	

COURSE SYNOPSIS

CORE COURSES

MKMV 1203 - Automotive Electronics & Control

This course focuses on vehicle electronic, incorporating studies on the principles of sensors and actuators used in automotive control applications. The major topics cover the variety and role of electronic sensors and actuators, sensor's signal conditioning systems, actuator's drivers and control systems in automotive applications. At the end of this course, students are expected to be able to design and develop electronic and control system for vehicles.

MKMM 1213 - Advanced Engineering Mathematics

The primary goal of this course is to get students involve very much in the post-calculus mathematics needed and used by engineers and scientists. The mechanical engineering field depends on mathematics for their description with development of new mathematics from new mechanical engineering problems. Thus, this course aims to place at the disposal of the engineer the basis of intelligent working knowledge of facts and techniques relevant to engineering applications which have not been treated in Advanced Calculus.

MKMV 1803 - Quality Engineering

This course is focusing on statistical methods in quality improvement. It encompasses various statistical process control problem-solving tools. Emphasis is given on analysis of additional control charts. Advanced tools and techniques such as Gauge Reliability and Reproducibility (GR & R), and experimental design methodology are also covered. At the end, students are able to formulate quality assurance methodology for automotive application.

MKMM 1903 - Research Methodology

This course aims to provide students with fundamental knowledge of research and the methodologies commonly used in engineering. It encompasses literature review, problem formulation, designing research methods, analysis methods and report writing.

MKMV 2213 - Automotive Noise, Vibration and Harshness

This course is focusing on the principle of vehicle vibration and acoustics. The discussion includes the effects of vibration and acoustic on vehicle systems or components, popular approaches for reducing the vibration and acoustic, human perception to noise, vibration and guidelines and assessment method. Finally, the discussion concludes with the application of popular computational methods for automotive NVH applications. At the end of the course, students are able to categorized NVH of passenger vehicles.

ELECTIVE COURSES

MKMV 1213 - Vehicle Engineering

The course focuses on the principles of vehicle engineering, including the principal functions of the body structure, chassis system, powertrain system and vehicle electrical & electronic systems. Additionally, the discussions include vehicle design to meet the acceleration, braking, cornering, ride, rollover, road loads, durability, safety and vibration requirements.

MKMV 1313 - Advanced Vehicle Dynamics

This course discusses vehicle dynamics in general which covers the vehicle's ride and handling behaviours. The systems which contribute to a better vehicle dynamic performance in modern passenger vehicle will be covered in this course. This includes the semi-active and active suspension systems, roll control systems, electronic brake force distribution (EBD) system, anti-lock braking system (ABS) and active steering system. All of the mentioned systems will be introduced theoretically followed by the development of the system's controlled-simulation model using MATLAB/SIMULINK. At the end of the course, the students are able to develop controlled systems that can improve vehicle's dynamic performances.

MKMV 1403 - Internal Combustion Engines

This course focusses on advanced knowledge of internal combustion engine. The discussion on principle operating and engineering characteristics of internal combustion engine (ICE) used in the automotive industry. This discussion includes engineering analyses knowledge on engine cycles and thermo chemistry applied to engine operation and engine fuels. This also includes advanced engine design and heat transfer. At the end, student must be able to design a highly efficient internal combustion engine.

MKMV 1503 - Drivetrain Engineering

This course covers principle knowledge of automotive drivetrain/transmission. It includes mechanical components and sub-systems which consider the mechanics of the components, force flow, free body diagram and its working principle. At the end of the course, students should be are able to design transmission system for passenger vehicles.

MKMV 2223 - Automotive Braking System

This course focuses on the principles of brake systems such as disc and drum brakes. The discussion includes analyzing deceleration behaviour of a road vehicle and braking performance including thermal characteristics, main features of Anti-lock brake system and finally the noise and vibration issues of the brake systems.

MKMV 2323 - Automotive Aerodynamics

This course is focusing on the principles and applications of ground vehicle aerodynamics such as passenger and racing cars. The course emphasis on analysing aerodynamic behaviour of road vehicles on the influence of aerodynamics on energy efficient, performance, stability and handling including internal flow and aero noise characteristics. The course includes the effect of crosswind on safety, the use of wind tunnel, computational fluid dynamics (CFD) and road/track testing.

MKMV 2413 - Advanced Engine Boosting and Downsizing

This course is designed to deliver the principles of engine boosting and its significant role towards engine downsizing. The course emphasizes on the engine air induction system, in particular the turbocharging and supercharging methods. It covers the science governing the operation of turbochargers and superchargers – which include aerodynamics, gas dynamics and thermodynamics. Upon completion of this course students are able to design a supercharger/turbocharger and match it with an engine.

MKMV 2513 - Automotive Tribology

Tribology is focusing on the friction, wear and lubrication principle and application. The course is originated from the art of lubrication but has developed to many different types and range of applications. Among the topics discussed are principle of lubrication and surface topography characterization. In automotive application, almost half of the mechanical power generated by the engine is wasted in friction between pistons and cylinders and within the gearbox and transmission gears. At the end of this course, students are able to predict the most suitable tribological surfaces characteristic for best tribological performance.