AUTOMOTIVE DESIGN AND MANUFACTURING ENGINEERING (INTERNATIONAL PROGRAM) (B.ENG)

Automotive design and manufacturing engineering is a highly demanded profession, which is linked to the national and global boosted growth of automotive industry. Automotive design involves the development of motor vehicles with a primarily concern on design of mechanical compornants and the creation of the product concept. Manufacturing engineering deals with all aspects of manufacture, from production control to materials handling to automation.

Our ADME graduates, being specialized, are trained in both automotive design and manufacturing engineering. Our program trains students to have a solid background in both fields with a flexibility to choose to specialize in either topic. This advantage doubles the job opportunities for our graduates, whilst serving the local and international automotive industry with qualified and versatile engineers with a broad academic background.

Each student is required to accumulate a minimum of 146 credits to graduate for Bachelor of Engineering Program in Automotive Design and Manufacturing Engineering (International Program) which also includes 2 credits of industrial training and 3 credits of senior project.

Curriculum board

Phulporn Saengbangpla	M.Sc (Machester,UK)
Pramote Dechaumphai	Ph.D. (Virginia)
Ekachai Leelarasmee	Ph.D. (California)
Asi Bunyajitradulya	Ph.D. (California)
Siriporn Damrongsakkul	Ph.D. (London)
Atiwong Suchato	Ph.D. (Massachusetts)
Patama Visuttipitukul	Ph.D. (Tokyo)
Sunhapos Chatranuwathana	Ph.D. (Michigan)
Chaodit Aswakul	Ph.D. (London)
Yan Zhao	Ph.D. (London)
Surapong Sirikulvadhana	M.S. (Michigan)
Varong Pavarajarn	Ph.D. (Oregon)

Professors

Mechanical Engineering

Pramote Dechaumphai	Ph.D. (Old Dominion)
Somsak Chaiyapinunt	Ph.D. (Oregon State)
Viboon Sangveraphunsiri	Ph.D. (Georgia Tech)

Associate Professors

Electrial Engineering

Ekachai Leelarasmee	Ph.D. (California)
Chedsada Chinrungrueng	Ph.D. (California Berkeley (U.S.A.)

Mechanical Engineering

Asi Bunyajitradulya	Ph.D. (UC Irvine)
Kuntinee Maneeratana	Ph.D. (London)
Pongtorn Charunyakorn	Ph.D. (Miami)
Kanit Wattanavichien	Ph.D. (Melbourne)
Ratchatin Chanchareon	D.Eng. (Chula)

Industrial Engineering

Somkiat Tangjitsitchareon	D.Eng. (Kobe Japan)

Metallurgical and materials Engineering

Seksak Asavavisithchai	Ph.D. (Nottingham)

Assistant Professors

Electrial Engineering

Wanchalerm Pora	Ph.D. (London)
Suree Pumrin	Ph.D.(Washington)

Mechanical Engineering

Boonchai Lertnuwat	Ph.D. (Tokyo)
Sunhapos Chantranuwathana	Ph.D. (Michigan)
Witaya Wannasuphoprasit	Ph.D. (Northwestern)
Nopdanai Ajavakom	Ph.D. (UC.Berkeley)
Niphon Wansophark	D.Eng. (Chula)
Alongkorn Pimpin	D.Eng. (Tokyo)
Chanat Ratanasumawong	D.Eng. (Tokyo Tech)
Phongsaen Pitakwatchara	M.S.M.E.
Thanyarat Singhanart	Ph.D. (Tokyo) (Georgia Tech)

Industrial Engineering

Somchai Puajindanetr	Ph.D. (London)
Haruetai Lohasiriwat	MS. (VPI & SU)

Metallurgical and materials Engineering

Itthipon Diewwanit	Sc.D. (MIT)

Lecturer

Electrial Engineering

Boonchuay Supmonchai	M.Eng. (Chula)

Mechanical Engineering

Nuksit Noomwongs	D.Eng. (TUAT)
Chirdpun Vitooraporn	(MIT)
Tawan Paphapote	Ph.D.C.United States of America

Industrial Engineering

Oran Kittithreerapronchai	Ph.D. Georgia

ISE Staffs

Phulporn Saengbangpla	M.Sc.,ME(England)
Yan Zhao	Ph.D. (London)
Prabhath De Silva	Ph.D. (USA)

Guest lecturer

Suradej Voranutsoontorn	Private Consultant
Somchai Peungperksuk	Ph.D.
Kaukeart Boonchukosol	Poitiers (Frence)

Visiting Professor (USA)

Arthur.J. McEvily Jr.Emeritus	Ph.D. (New York)

Curriculum

Total number of credits requirement	147	credits
General Education	30	credits
Core Courses	111	credits
Basic Sciences	21	creditis
Basic Engineering	31	credits
Compulsory	50	credits
Approved Electives	9	credits
Free Electives	6	credits

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1. General Education   **30 credits**

	Social Science	3	credits
	Humanity	3	credits
	Science and Mathematics	3	credits
	Interdisciplinary	3	credits
	Foreign Language	12	credits
5501112	Communicative English I	3(3-0-6)	
5501123	Communicative English II	3(3-0-6)	
5501214	Communication and Presentation Skills	3(3-0-6)	
5501225	Technical Writing	3(3-0-6)	
	General Education (Special)	6	credits
2140111	Exploring Engineering World	3(3-0-6)	
2183281	Introduction to Automotive Eng.	3(3-0-6)	

2. Core Course   **111 credits**

	Basic Sciences	21	credits
2301107	Calculus I	3(3-0-6)	
2301108	Calculus II	3(3-0-6)	
2301312	Differential Equations	3(3-0-6)	
2302103	General Chemistry Laboratory	1(0-3-0)	
2302105	Chemistry for Engineers	3(3-0-6)	
2304153	Physics for Engineers	3(3-0-6)	
2304154	Physics and Electronics for Eng.	3(0-3-0)	
2304193	Physics Laboratory for Eng.	1(0-3-0)	
2304194	Physics and Electronics Laboratory for Engineers	1(0-3-0)	

	Basic Engineering	31	credits
2140301	Industrial Training	2(0-6-0)	
2142251	Manufacturing Process for Automotive Eng I	3(2-3-4)	
2142252	Manufacturing Process for Automotive Eng II	3(2-3-4)	
2182210	Electrical Circuit	3(3-0-6)	
2182213	Electrical Circuit Laboratory	1(0-3-0)	
2183101	Engineering Graphics	3(2-3-4)	
2183212	Statics	3(3-0-6)	
2184201	Probability and Statistics for Automotive Engineering	3(3-0-6)	
2184303	Engineering Management	3(3-0-6)	
2189101	Engineering Materials	3(3-0-6)	
2190101	Computer Programming	3(3-0-6)	
2190151	Computer Programming Laboratory	1(0-3-0)	

	Compulsory Courses	50	credits
2142201	Engineering First	3(3-0-6)	
2142242	Vehicle Dynamics	3(3-0-6)	
2142498	Automotive Engineering Pre-Project	1(0-2-1)	

2142499	Automotive Engineering Project	3(0-6-3)
2182310	Electronics and Instrument For Automobile	3(3-0-6)
2183213	Mechanics of Material	3(3-0-6)
2183221	Thermodynamics	3(3-0-6)
2183222	Fluid Mechanics	3(3-0-6)
2183231	Dynamics	3(3-0-6)
2183261	Mechanical Engineering Laboratory	2(1-3-2)
2183271	Automotive Engineering Workshop	1(0-3-0)
2183272	Automotive Instrument Laboratory	1(0-3-0)
2183321	Heat Transfer	3(3-0-6)
2183322	Internal Combustion Engine	3(3-0-6)
2183331	Mechanics of Machinery	3(3-0-6)
2183332	CAD/CAM/CAE	3(2-3-4)
2183351	Machanical Engineering Design	3(3-0-6)
2183352	Motor Vehicle Design	3(2-3-4)
2184302	Product Development Process	3(3-0-6)

	Approved Electives	9	credits
2142352	Finite Element Methods and Applications	3(3-0-6)	
2142422	Vehicle Aerodynamics	3(3-0-6)	
2142423	Power Train Systems	3(3-0-6)	
2142426	Noise, Vibration and Harshness	3(3-0-6)	
2142428	Automotive Diagnostics and Maintenance	3(3-0-6)	
2142433	Failure Analysis and NDT	3(2-3-4)	
2142461	Automation and Robotics	3(3-0-6)	
2142488	Measurement, Instrumentation And Data Acquisition	3(3-0-6)	
2142492	Selected Topics in Automotive Engineering I	3(2-3-4)	
2142493	Selected Topics in Automotive Engineering II	3(2-3-4)	
2142495	Independent Studies	3(0-6-3)	
2182430	System Dynamics and Controls	3(3-0-6)	
2182442	Embedded Systems in Automotive Engineering	3(3-0-6)	
2183431	Mechanical Vibrations	3(3-0-6)	
2184401	Engineering Experimental Design	3(3-0-6)	
2184404	Process Management and Lean Manufacturing	3(3-0-6)	
2184405	Product Planning and Control	3(3-0-6)	
2184406	Quality Control and Management For Automotive Industry	3(3-0-6)	
2184407	Quality Design and Innovation Management	3(3-0-6)	
2184409	Value Engineering	3(3-0-6)	
2189102	Engineering Materials II	3(3-0-6)	
2190216	Information Technology for Professional Communications	2(1-3-2)	

3. Free Electives   **6 credits**

      Select 6 credits from any courses offered in English by any International Programs in Chulalongkorn University.

AUTOMOTIVE DESIGN AND MANUFACTURING
ENGINEERING CURRICULUM
(INTERNATIONAL PROGRAM)
(B.ENG)

COURSE NO.	SUBJECT	CREDITS	COURSE NO.	SUBJECT	CREDITS
FIRST SEMESTER			**FIFTH SEMESTER**		
2190101	Computer Programming	3	2182310	Electronics and Instrumentation for Auto	3
2190151	Computer Programming Laboratory	1	2183222	Fluid Mechanics	3
2301107	Calculus I	3	2183261	Mechanical Engineering Laboratory	2
2302103	General Chemistry Laboratory	1	2183272	Automotive Instrument Laboratory	1
2302105	Chemistry for Eng.	3	2183331	Mechanics of Machinery	3
2304153	Physics for Eng.	3	2184302	Product Development Process	3
2304193	Physics Lab for Engineers	1	5501225	Technical Writing	3
5501112	Communicative Eng I	3			18
		18			
SECOND SEMESTER			**SIXTH SEMESTER**		
2140111	Exploring Engineering World	3	2142424	Vehicle Dynamics	3
2183101	Engineering Graphics	3	2183321	Heat Transfer	3
2189101	Engineering Materials	3	2183332	CAD/CAM/CAE	3
2301108	Calculus II	3	2183351	Mechanical Engineering Design	3
2304154	Physics and Electronics for Eng.	3	2184303	Engineering Management	3
2304194	Physics and Electronics Lab for Eng.	1	xxxxxxx	General Education	3
5501123	Communicative English II	3			18
		19			
THIRD SEMESTER			**SUMMER SEMESTER**		
2142251	Manufacturing Process for Automotive Eng I	3	2140301	Industrial Training	2
2183212	Statics	3			
2183221	Thermodynamics	3	**SEVENTH SEMESTER**		
2183271	Automotive Engineering Workshop	1	2142498	Automotive Engineering Pre-Project	1
2183281	Introduction to Automotive Eng.	3	2183322	Internal Combustion Engine	3
2184201	Probability and Statistics for Auto Eng.	3	2183352	Motor Vehicle Design	3
2301312	Differential Equations	3	xxxxxxx	Approved Elective	3
		19	xxxxxxx	Approved Elective	3
			xxxxxxx	General Education	3
FOURTH SEMESTER			xxxxxxx	General Education	3
2142201	Engineering First	3	xxxxxxx	Free Elective	3
2142252	Manufacturing Process for Auto Eng II	3			22
2182210	Electrical Circuit	3			
2182213	Electrical Circuit Laboratory	1	**EIGHTH SEMESTER**		
2183213	Mechanics of Materials	3	2142499	Automotive Engineering Project	3
2183231	Dynamics	3	xxxxxxx	Approve Electives	3
5501214	Communication and Presentation Skills	3	xxxxxxx	General Education	3
		19	xxxxxxx	Free Elective	3
					12

TOTAL CREDITS FOR GRADUATION   **147**

COURSES DESCRIPTIONS IN AUTOMOTIVE DESIGN AND MANUFACTURING ENGINEERING (B.ENG)

General Education

2140111   Exploring Engineering World   3(3-0-6)
Engineering topics related to daily life: energy, resources, environment manufacturing, process, industry, material, automotive, infrastructure, information system and bio engineering.

2183281   Introduction to Automotive   3(3-0-6)
**   Engineering**
Basic Principles of automotive systems, components, and design; internal combustion engine; transmission; chassis; suspension; steering; brake; body; vehicle aerodynamics and automotive electronics; basic vegicle dynamics; performance and handling.

5501112   Communicative English I   3(3-0-6)
Practice language skills in acquiring information and knowledge from different sources and media in subjects of students' interest under selected themes; collecting information, summarizing and presenting important issues.

5501123   Communicative English II   3(3-0-6)
**   Condition: PRER 5501112***
Practice language skills in acquiring analyzing and synthesizing information and knowledge from different sources and media on topics of students' interest under selected themes; summarizing what they have learned, and presenting opinions from group discussion.

5501214   Communication and Presentation   3(3-0-6)
**   Skills Condition: PRER 5501123***
Practice using English for social communication and giving oral presentation on engineering related topics.

5501225   Technical Writing   3(3-0-6)
**   Condition: PRER 5501123***
Practice in writing summaries composing different types and styles of writing in the field of engineering and writing reports of studies and experiments.

Core Course

2301107   Calculus 1   3(3-0-6)
Limit, continuity, differentiation and integration of real-valued functions of a real variable and their applications; techniques of integration; improper integrals.

2301108   Calculus 2   3(3-0-6)
**   Condition: PRER 2301107**
Mathematical induction; sequences and series of real numbers; Taylor series expansion and approximation of elementary functions; numerical integration; vectors, lines and planes in three dimensional space; calculus of vector valued functions of one variable; calculus of real valued functions of two variables; introduction to differential equations and their applications.

2301312   Differential Equations   3(3-0-6)
**   Condition: PRER 2301108**
Existence and uniqueness theorem of solution of first order equations; initial value problem; Laplace transform; Taylor series expansion of elementary functions; numerical methods; general linear equations; solution in series; linear partial differential equations boundary value problems.

2302103   General Chemistry Laboratory   1(0-3-0)
Standard solution preparation; qualitative analysis; titration; electrochemistry, pH metric titration; spectroscopy; calculation and evaluation of data; calibration curve; introduction to polymer.

2302105   Chemistry for Engineers   3(3-0-6)
Stoichiometry and basis of the atomic theory; properties of the three states of matter and solution; thermodynamics; chemical equilibrium; Oxidation-reduction; chemical kinetics; the electronic structures of atoms and the chemical bond; periodic table; nonmetal and transition metal.

2304153   Physics for Engineers   3(3-0-6)
Mechanics of particles and rigid bodies; properties of matter; fluid mechanics; heat; vibrations and waves; elements of electromagenetism; optics; modern physics.

2304154   Physics and Electronics for   3(3-0-6)
**   Engineers**
Engctricity DC circuits; AC circuits; basic electronics; electrical actuators.

2304193   Physics Laboratory for Engineers   1(0-3-6)
Measurement and precision; experiments on simple harmonic motion; radius of gyration; dynamics of rotation; velocity of sound; viscosity of fluids.

2304194   Physics and Electronics   3(3-0-6)
**   Laboratory for Engineers**
Resistance and electromotive force measurements; experiments on ampmeter; voltmeter; oscilloscope; AC circuit; transistor; lenses and mirrors; polarization; interference; diffraction.

2140301   Industrial Training   2(0-6-0)
Engineering practice in related areas under supervision of experienced engineers in private sectors or government agencies.

2142251   Manufacturing Process for   3(2-3-4)
**   Automotive Engineering I**
Introduction to the principles of manufacturing as related to automotive engineering; relationship between manufacturing process, material properties and structure; fundamentals of bulk deformation, sheet metal forming processes; fundamentals of solidification processing; fundamentals of metal joining; principles of heat treatment and surface modification.

2142252   Manufacturing Process for   3(2-3-4)
**   Automotive Engineering II**
**   Condition: PRER 2142251***
Metal removal and machining processes; processes of non-metallic materials: glass, polymers, and ceramics; surface and tribological characteristics; application of automation and computer integrated manufacturing systems in automotive part manufacturing: fundamentals of automotive part designs and technology management; supply chains and structure of automotive part manufacturing.

2182210   Electrical Circuit Laboratory   3(3-0-6)
DC circuit; analysis; Kirchhoff's laws; The venin's abd Birtib's theorem; transistor amplifier circuit; semiconductor devices; op-amp circuits; digital circuits; DC motor.

2182213   Electrical Circuit Laboratory   1(0-3-0)
Eletronic instruments; multimeter; oscilloscope; DC circuit; Voltage regolators; filter circuit; transistor amplifer circuit; op-amp circuits; digital Circuits; DC motor.

2183101   Engineering Graphics   3(2-3-4)
Lettering; orthographic projections; sketching and drawing; pictorial drawing; dimensioning; tolerancing and geometrical tolerancing; section; working drawing; mechanical parts drawing; introduction to CAD.

2183212 Statics 3(3-0-6)
Force systems; resultants; equilibrium; structure; distributed force; friction; virtual work; stability.

**2184201 Probability and Statistics for 3(3-0-6)
Automotive Engineering**
Engineering basis in statistics and probability; discrete and continuous probability distribution; joint probability distribution; parameter estimation: esto,atpr. Bias, consistency; point estimation; interval estimation; automotive engineering applications in measurement and uncertainty, linear regression, introduction to random process; integration of statistics in automotive engineering applications; case studies.

2184303 Engineering Management 3(3-0-6)
Modern management principles; methods of increasing productivity; human relations; industrial safety; pollution problems; commercial laws; basics of engineering economy, finance, marketing, and project management.

2189101 Engineering Materials 3(3-0-6)
Important engineering materials: metals, plastics, asphalt, wood and concrete; phase diagram and its interpretation; testing and meaning of various properties; macroscopic and microscopic structure which are correlating with properties of theengineering materials; production process of products from engineering materials.

2190101 Computer Programming 3(3-0-6)
Introduction to computer systems; problem-solving using computers; programming in highlevel languages; program structure, programming style and convention; control statements, data handling and processing; subprograms; classes and objects.

**2190151 Computer Programming 1(0-3-0)
Laboratory
Condition: COREQ 2190101***
Computer programming in Engineering; reviews of computer programming concepts; hands-on experience on computer programming using contemporary Engineering tools.

2142201 Engineering First 3(3-0-6)
Basic skills in engineering; problem solving, communication skills, team work skills through small class projects; dissection skills.

**2142424 Vehicle Dynamics 3(3-0-6)
Condition: PRER 2183231**
Dynamics of motor vehicles; properties of pneumatic tire; suspension and steering mechanism; vehicle longitudinal dynamics; linear bicycle models; stability; linear engine models; pleasure in driving.

**2142498 Automotive Engineering 1(0-2-1)
Pre-Project**
Preliminary study for automotive engineering; project formulation and proposal.

2142499 Automotive Engineering Project 1(0-3-0)
Group or individual project on a subject related to automotive engineering and manufacturing.

**2182310 Electronics and Instrument for 3(3-0-6)
Automobile Condition: PRER 2182210**
Introduction to digital circuits; introduction to microprocessors and microprocessors based systems; basic instrumentation; application of different types of instrumentations to automotive systems.

**2183213 Mechanics Material 3(3-0-6)
Condition: PRER 2183212**
Force and stress; stresses and strains relationship; Hooke's law; modulus of elasticity; stresses in beams; shear force; bending moment diagrams; deflection of beams; torsion; buckling of columns; Mohr's circle; combined stresses; failure criterion; safety factors.

2183221 Thermodynamics 3(3-0-6)
Basic concepts; thermodynamic state and process; properties of pure substances and ideal gases; energy; the first law of thermodynamics and the first law analysis for isolated, closed, and open systems; entropy; the second law of thermodynamics and the second law analysis for isolated, closed, and opens systems; gas power cycles; Carnot, Otto, and Brayton cycles; refrigeration cycle; introduction to gas mixtures; introduction to combustion.

2183222 Fluid Mechanics 3(3-0-6)
Basic concepts in physics: physical quantity and physical quantity relations, dimensions of physical quantity and the principle of dimensional homogeneity, dimensionless variables; basic concepts in fluid mechanics: continuum assumption, methods of description: Lagrangian and Eulerian descriptions, field quantity and classification of flow fields: geometric and kinematics of fluid motion: pathlines, streamlines, and streaklines; forces and stresses in fluids: pressure and pressure force, shear stress and shear force; convection flux and Reynold's transport theorem; physical laws of finite control volume: conservations of mass, linear momentum, and energy; conservation of angular momentum with application to turbomachines; physical laws of infinite control volume: conservation of mass and linear momentum, introduction to Navier-Stokes and Euler's equations; Bernoulli's equation from momentum and conservation of mechanical energy viewpoints; introduction to vorticity and vortex; dimensional analysis: Buckingham's PI theorem, similarity, and model testing; internal viscous flows, energy consideration in pipe flows and piping system; system; external flows, boundary layer, and aerodynamic force and moment; applications: turbomachines, model testing, piping and pumping system, aerodynamic force and moment.

2183231 Dynamics 3(3-0-6)
Kinematics of three-dimensional curvilinear motion of a particle; kinetics of a particle: force and acceleration, work and energy, impulse and momentum; kinematics of planar motion of a rigid body: absolute and relative motion analysis; kinetics of planar motion of a rigid body: absolute and relative motion analysis; kinetics of planar motion at a rigid body; force and acceleration, work and energy, impulse and momentum; introduction to kinematics and kineties of three-dimensional motion of a rigid body.

2183261 Mechanical Engineering Laboratory 2(1-3-2)
Experimentation and basic concepts; error and uncertainty analysis; measurement and instrumentation; data analysis; interpretation of experimental results; reporting of experimental results; basic experiments in solid mechanics, thermodynamics, fluid mechanics and basic engine testing.

2183271 Automotive Engineering Workshop 1(0-3-0)
Hand-on study of automotive systems and components; names and functions of components and parts; basic mechanical parts; engine; electronic systems; power train; brake systems; steering mechanism; basic diagnosis.

2183272 Automotive Instrument Laboratory 1(0-3-0)
Basic electronics; electronic systems in automobiles; engine performance testing; basic automotive diagnosis.

2183321　Heat Transfer　　　　3(3-0-6)
Condition: PRER 2183222*
　　Modes of heat transfer; general forms of heat conduction equations; steady one-dimensional heat conducton; steady two-dimensional heat conduction; transient one-dimensional heat conduction; introduction of convection and boundary layer; external flow; internal flow; free convection; heat exchangers; introduction of radiation of black body and gray surfaces; view factors; radiation exchange between gray, diffuse surfaces in an enclosure.

2183322　Internal Combustion Engine　　3(3-0-6)
　　Internal combustion engines; basic principles; fluid flow; thermodynamics; fuels and combustion; ideal fuel air cycle; heat transfer; friction and lubrication; efficiency and emission; different types of engines; spark-ignition and compression-ignition; ignition systems; supercharging and scavenging; performance and testing.

2183331　Mechanics of Machinery　　3(3-0-6)
　　Basic mechanisms; gear trains; displacements; velocity and acceleration in machines; statics and dynamics force analysis; balances of rotating and reciprocating masses; gyroscopic effects.

**2183332　Computer Aided Design/Computer　3(2-3-4)
　　　　　　Aided Manufacturing and Computer
　　　　　　Aided Engineering**
　　Introduction to CAD/CAM/CAE, 3D solid modeling, design concepts and implementation; link to manufacturing interface.

2183351　Mechanical Engineering Design　3(3-0-6)
　　Fundamentals of mechanical engineering design; properties of materials; theory of filure; fatigue; design of basic machine elements; design project of a simple mechanical machine.

2183352　Motor Vehicle Design　　3(3-0-6)
　　Systematic approach to automotive design; space defining components; ergonomics; automotive safety and legal regulations.

2184302　Product Development Process　3(3-0-6)
　　Product requirements and specifications; reverse engineering; use of CMM; product design by CAD.

**2142352　Finite Element Methods and　　3(3-0-6)
　　　　　　Applications**
　　Basic principles of finite element methods; applications of finite elements in analysis using computer programs.

2142422　Vehicle Aerodynamics　　3(3-0-6)
　　Effects of vegicle design on aerodynamics; wind tunnel testing; boundary layers and wakes; friction and pressure drag; aerodynamic forces and moments; center of pressure and vehicle stability.

2142423　Power Train Systems　　3(3-0-6)
　　Manual and automatic transmission; basic operation of transmission; peripheral components.

2142426　Noise, Vibration and Harshness　3(3-0-6)
　　NVH and its importance for automotive industry. Sources of sound and vibration. Noise quality. Acceleration. Velocity, displacement, and sound pressure/intensity. DB Scales. Introduction to vibration. Free and forced vibration response of one and two degrees of freedom systems. Methods for determining natural frequencies and mode shapes for multi-degrees of freedom systems. Vibration measurement and control. Suspensions mounting systems. Road Simulators and wind tunnels. Noise and vibrations standards.

**2142428　Automotive Diagnostics and　　2(1-3-2)
　　　　　　Maintenance**
　　Basic knowledge in Automobile components and its functions; troubleshooting guides, diagnostic tools for automobiles; do-it-yourself car care; knowledge in schedule services, maintenances and repair; defensive driving techniques.

**2142433　Failure Analysis and　　　3(2-3-4)
　　　　　　Nondestructive Testing**
　　Analysis and diagnosis of the causes of failure; physics of failure; concepts of reliability, the use of failure analysis as part of the design process, time based/related failure modes, safety factors; case studies; elimination of failures through proper material selection, treatment and use; case histories; examination of fracture surfaces; laboratory investigations of different failure mechanisms.

2142461　Automation and Robotics　　3(3-0-6)
　　Basic automation systems, equipment, sensors, actuators, material handling system, robots and their applications.

**2142488　Measurement, Instrumentation　3(3-0-6)
　　　　　　and Data Acquisition**
　　Basic electromechanical techniques used in modern instrumentation and control systems; use of transducers and actuators; signal conditioning, grounding, and shielding; signal processing and feedback control methods with emphasis on frequency domain techniques; low-level measurements; lock-in technique.

**2142492　Selected Topics in Automotive　3(2-3-4)
　　　　　　Engineering I**
　　Selected interesting topics in automotive engineering.

**2142493　Selected Topics in Automotive　3(2-3-4)
　　　　　　Engineering II**
　　Selected interesting topics in automotive engineering.

2142495　Independent Studies　　　3(0-6-3)
　　Self study on topics related to automotive engineering with consent of the instructor, the study may be theoretical or experimental in nature.

**2182430　System Dynamics and Controls　3(3-0-6)
　　　　　　Condition: PRER 2182210**
　　System dynamics modeling; responses; introduction to control systems; feedback control system characteristics; the performance of feedback control systems; the stability of linear feedback systems; essential principles of feedback; the root locus method; time-domain analysis and design of control systems; frequency response method; stability of the frequency domain and compensation; use of computer in the design of control systems.

**2142442　Embedded Systems in　　　3(3-0-6)
　　　　　　Automotive Engineering**
　　Microprocessor architecture; introduction to embedded systems; programming concepts in C; software engineering practices; buses; device drivers and interrupt; inter-process communication; real-time operating system; hardware/software co-design.

2183431　Mechanical Vibrations　　3(3-0-6)
　　Analysis of system with single and multi degree of freedom; torsional vibration; free and forced vibration; determination of natural frequencies of structures; discrete system; Model analysis; methods and techniques to reduce and control vibration; Lagrange's equations.

2184401 Engineering Experimental Design 3(3-0-6)

Factorial design; 2k factorial design; blocking and confound; fractional factorial design; factorial experiments with random factors; nested and split-plot design; non-linear regression analysis; response surface analysis.

2184404 Process Management and Lean 3(3-0-6)
Manufacturing

Introduction to process management; key techniques and managing approaches commonly used in automotive industry; application and case studies.

2184405 Product Planning and Control 3(3-0-6)

The role of production planning and control in the manufacturing system; strategic planning of manufacturing systems; demand forecasting; inventory control, planning, scheduling, and control of operation; capacity planning.

2184406 Quality Control and Management 3(3-0-6)
for Automotive Industry

Introduction to metrology and characterization; principles of destructive and non-destructive testing as applied in automotive part manufacturing. Concept of quality control, quality improvement, quality assurance, quality management, cost of quality; quality management systems: ISO series; failure mode and effects analysis; basic quality control tools; statistical process control: control charts, process capability analysis, measurement system analysis, acceptance sampling plans.

2184407 Quality Design and Innovation 3(3-0-6)
Management

Kay issues and core concept of quality design and innovation management, innovation strategy; project management, concept fomation and selection, quality design and innovation development processes, business plan, risk management, techniques and tools for effective implementation of innovation.

2184409 Value Engineering 3(3-0-6)

Introduction to value engineering methodology; application of value engineering techniques to product design; procurement and manufacturing in order to reduce cost without the loss of quality.

2189102 Engineering Materials II 3(3-0-6)
Condition: PRER 2189101

Advanced topics and other specific applications as related to automative materials; specific automotive materials; introduction to engineered materials specifically developed for automotive applications; composite materials; tyre and rubber technology, modification of surface characteristics as related to tribological and corrosion properties.

2190216 Information Technology for 2(1-3-2)
Professional Communications

IT skills in professional communication; presentation skills; use of computer software for effective professional communication.