Iligan Institute of Technology
of the Mindanao State University
Quality Education for a better Mindanao

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

Introduction

There are over 22 schools in Mindanao that offer Bachelor of Science in Mechanical Engineering and majority of their faculty members do not have an MSME degree. With MSU-IIT near their home institutions and offering the MSME program, these faculty members can be motivated to pursue graduate studies, thus improving the quality of education of the mechanical engineers in Mindanao. This will also affirm MSU-IIT's role as Mindanao's center of excellence in science and technology.

Objectives

The MSME program is offered with the following objectives:

1. to provided training and education necessary for research and development;
2. to stimulate research and development in the field of mechanical engineering, and
3. to contribute to the manpower needs of the Philippines in the 21st century.

Admission Requirements

An applicant must have a bachelor's degree in Mechanical Engineering or allied fields from MSU-IIT or from any accredited university or tertiary institution acceptable to the Admission Committee. The applicant must possess a high degree or aptitude to pursue research. The applicant must also comply with the general admission requirements of the MSU-IIT Graduate School. In addition, the department admission committee may require the applicant to undergo an examination or other related requirements.

Program Requirements

Upon admission to the program, a comprehensive plan of study will be designed by the candidate in consultation with his/her adviser. The plan of study must satisfy the program requirements of a minimum of 30 units including thesis with a credit of six units for the Thesis Option and a minimum of 36 units of course works for the Non-Thesis Option. These units are allocated below:

Thesis Option		**Non-Thesis Option**	
Applied Mathematics	6 units	Applied Mathematics	6 units
Major Subjects	15	Major Subjects	15
Electives	3	Electives	12
Thesis	6	Special Project	3
		Comprehensive Exam	-
	------		------
Total	**30 units**		**36 units**

MASTER OF SCIENCE IN MECHANICAL ENGINEERING (MSME)

(LIST OF COURSES BY SEMESTER, THESIS OPTION)

First Year, First Semester

Course No.	Course Title	Units	Hrs/Wk			Prerequisite(s)
			Lec	Lab	Total	
ES 202	Advanced Engineering Mathematics I	3	3	0	3	
	Foundation Course	3	3	0	3	
	Core Course	3	3	0	3	
	Core Course	3	3	0	3	
	Total	12	12	0	12	

First Year, Second Semester

Course No.	Course Title	Units	Hrs/Wk			Prerequisite(s)
			Lec	Lab	Total	
	Core Course	3	3	0	3	
	Core Course	3	3	0	3	
	Core Course	3	3	0	3	
	Elective	3	3	0	3	
	Total	12	12	0	12	

Second Year, First Semester

Course No.	Course Title	Units	Hrs/Wk			Prerequisite(s)
			Lec	Lab	Total	
ME 300	Thesis	6				
	Total	6				

Second Year, Second Semester

Course No.	Course Title	Units	Hrs/Wk			Prerequisite(s)
			Lec	Lab	Total	
ME 300	(Thesis Continuation)	-				
	Total	-				

MASTER OF SCIENCE IN MECHANICAL ENGINEERING (MSME)
(LIST OF COURSES BY SEMESTER, COURSEWORK OPTION)

First Year, First Semester

Course No.	Course Title	Units	Hrs/Wk			Prerequisite(s)
			Lec	Lab	Total	
ES 202	Advanced Engineering Mathematics I	3	3	0	3	
	Foundation Course	3	3	0	3	
	Core Course	3	3	0	3	
	Core Course	3	3	0	3	
	Total	12	12	0	12	

First Year, Second Semester

Course No.	Course Title	Units	Hrs/Wk			Prerequisite(s)
			Lec	**Lab**	**Total**	
	Foundation Course	3	3	0	3	
	Core Course	3	3	0	3	
	Core Course	3	3	0	3	
	Elective	3	3	0	3	
	Total	12	12	0	12	

Second Year, First Semester

Course No.	Course Title	Units	Hrs/Wk			Prerequisite(s)
			Lec	**Lab**	**Total**	
	Core Course	3	3	0	3	
	Core Course	3	3	0	3	
	Elective	3	3	0	3	
ME 299	Special Project	3	3	0	3	
	Total	12	12	0	12	

Second Year, Second Semester

Course No.	Course Title	Units	Hrs/Wk			Prerequisite(s)
			Lec	**Lab**	**Total**	
	Core Course	3	3	0	3	
	Core Course	3	3	0	3	
	Elective	3	3	0	3	
	Comprehensive Exam	-				
	Total	9	9	0	9	

CATALOGUE OF COURSES

ES 201 ADVANCED ENGINEERING MATHEMATICS I

Vector spaces; linear independence; matrices; rank and inverse of a matrix decomposition theorems; eigenvalues and eigenvectors; unitary and similarity transformations on matrices, initial and boundary value problems, power series solutions; application to engineering problems.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ES 202 ADVANCED ENGINEERING MATHEMATICS II

Boundary value problems of differential equations; Sturm-Liouville theory; singular boundary condition, orthogonal expansions, separation of variables in partial differential equations, spherical harmonics.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ES 203 ADVANCED ENGINEERING MATHEMATICS III

Applications of vector analysis, curvilinear coordinates, and conformal matting to the solutions of engineering problems. Complex variables.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ES 205 NUMERICAL METHODS IN ENGINEERING

Error analysis; solution of non-linear equations; direct and iterative methods of solving linear systems, approximations of functions, numerical differentiation and integration; numerical solution of ordinary differential equations; computer machine problems.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ME 252 GAS DYNAMICS

Fundamentals of gas dynamics. Steady one-dimensional flow. Shock regions. Introduction to propulsion systems.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ME 253 COMBUSTION

Physical and chemical aspects or basic combustion phenomena. Classification of flames. Measurement of laminar flame speeds. Factors influencing burning velocity. Theory of flame propagation. Flammability, chemical aspects, chemical equilibrium, chain reactions. Calculation and measurement of flame temperature. Diffusion flames. Fuels - atomization and evaporation of liquid fuels. Theories of ignition, stability, and combustion efficiency.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ME 254 THERMAL ENGINEERING

Characteristics of gaseous, liquid and solid fuels. Local materials. Efficient burning of fuels in furnaces, kilns, gas producers, engine and other heat engine. Performance calculations. Treatment of fuel to improve its suitability for a given heat equipment.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ME 255 ADVANCED HEAT CONDUCTION

Steady and transient heat conduction. Stationary and moving sources. Numerical and graphical methods. Porous systems.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : ES 202 (Advanced Engineering Mathematics II) or consent of Instructor

ME 256 ADVANCED HEAT CONVECTION

Mechanism of fluid flow, energy relationship of flowing fluid. Convection heat transfer. Momentum, heat and mass transfer analogies. Boiling and condensing heat transfer.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : ES 202 or with consent of Instructor

ME 257 ADVANCED HEAT RADIATION

Radiation heat transfer. Shape factors in an absorbing and non-absorbing media. Thermal radiation from gasses and flames.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : ES 202 or with consent of Instructor

ME 258 TWO-PHASE FLOW AND HEAT TRANSFER

Nature of multiphase flow. An intensive study of flow patterns in multi-component flows and the application of these principles to pipe design. Modeling of two-phase flow in vertical, horizontal and inclined pipes. Two-phase flow in adiabatic pipes and heated pipes. Correlation of pressure changes and heat transfer in pipes. The prediction of gaseous and liquid diffusion coefficients.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : ES 202 (Advanced Engineering Mathematics II) and ME 256 (Advanced Heat Convection)

ME 259 THERMAL SCIENCE APPLICATIONS IN POWER ENGINEERING

Power system thermodynamics. Power Plant cycles; processes; and components, combustion equipment, heat exchangers, turbines, and pumps. Water supply and treatment systems. Air circulating and heating systems. Operation, efficiency and energy balance calculations of power stations. Economics and management of power production. Environmental impacts of thermal plants.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ME 260 ADVANCED DYNAMICS

Generalized coordinates, classification of dynamic systems with finite degrees of freedom. Lagrange equations for rheonomic, non-holoromic systems. Ignorable coordinates, small oscillations about steady solutions, and introduction to stability.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ME 261 CONTINUUM MECHANICS

Introduction to Cartesian tensor. Basic principles of continuum mechanics; concepts of deformation, motion, stress, and strain; conservation of mass, balance of momenta, continuum thermodynamics, and constitutive equations. Illustrative applications in elasticity, fluid dynamics, and viscoelasticity.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ME 262 ADVANCED STRESS ANALYSIS

Studies of stresses and strains in three-dimensional problems. Failure theories and yield criteria. Stress function approach to two-dimensional problems. Bending of nonhomogeneous asymmetric curved beams. Torsion of bars with noncircular cross sections. Energy methods. Elastic stability. Introduction to plates.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ME 263 FINITE ELEMENT ANALYSIS

After the concepts of finite elements methods are presented, formulation for different engineering problems and their applications are studied. Topics include variational methods. The finite element concept, and applications in stress analysis, dynamics, fluid mechanics, and heat transfer.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ME 264 ADVANCED KINEMATICS

Geometry of constrained plain motion with application to linkage design. Type and number synthesis, size synthesis, path curvature, inflection circle, cubic of stationary curvature. Finite displacements, three-and four-separated positions. Graphical analytical, and computer techniques.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ME 265 INTERACTIVE COMPUTER GRAPHICS

The principles of computer graphics and interactive graphical methods for problem solving. Emphasis is placed on development and use of graphical tools for various display devices. Topics include pen plotting, storage tube, three dimensions color, modeling of geometry, and hidden surface representation of systems, controllability and observability, stability, probability and random signals, correlation, autocorrelation, and spectral density. Modeling technique and design of controllers using digital and analog controllers.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : ES 202 (Advanced Engineering Mathematics II) and
(Vector Analysis and Complex Variables)

ME 266 COMPUTATIONAL FLUID DYNAMICS

Application of finite difference methods, finite elements methods, and the method of characteristics for the numerical solutions of fluid dynamics problems. Incompressible viscous flows: vorticity transport equation, stream function equation, and boundary conditions. Compressible flows: treatment of shocks, implicit and explicit artificial viscosity techniques, and boundary conditions. Computational grids: graphical methods for problem solving. Emphasis is placed on development and use of graphical tools for various display devices.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : ES 202 (Advanced Engineering Mathematics II)

ME 267 MECHANICAL VIBRATIONS

Linear vibration analysis of multi-degree-of-freedom systems. Torsional vibrations in gears and shaft systems. Finite elements analysis of machine members dynamics. Introduction to experimental vibration analysis using Fast Fourier Transform (FFT) techniques. Typical sources of vibration in machines. Experimental modal analysis.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : ES 202 (Advanced Engineering Mathematics II) or consent of Instructor

ME 268 ANALYSIS OF PLATES AND SHELLS

Bending of rectangular and circular plates under normal loading; thermal stresses in plates. Stresses in thick and thin shells; bending and thermal stresses at joints. Design of pressure vessels.

Credit : 3 units (3 hrs lec)

ME 271 ADVANCED THERMODYNAMICS

Mathematical development of thermodynamic functions, irreversible processes Thermodynamic relations, equilibrium, real gases, applications to heat engines.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ME 272 ENERGY CONVERSION SYSTEMS

A comparative study of conventional and alternative energy conversion systems including economic and environmental concerns.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ME 274 ADVANCED ENERGY RESOURCES ENGINEERING

Application of new methods and concepts to the development of present and future energy sources.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ME 276 SOLAR ENERGY

Study of solar energy conversion. Solar space-and-water heating and cooling systems including economic considerations.

Credit :
Prerequisite(s) : Consent of Instructor

ME 278 ENERGY SYSTEMS DESIGN

Design of energy systems by synthetic and/or experimental procedures. Technical and economic feasibility to be established.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ME 281 ADVANCED REFRIGERATION

Advanced study of refrigeration processes and cycles including design problems and special applications. Low temperature systems, liquefaction of gases, thermoelectric cooling and absorption systems.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ME 282 ADVANCED AIR CONDITIONING AND VENTILATION

Advanced studies covering principles and applications of cooling, heating and air moving systems. Design and selection of air conditioning equipment, piping and duct systems.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : Consent of Instructor

ME 283 REFRIGERATION AND AIR CONDITIONING FOR FOOD PROCESSING AND STORAGE

Food freezing and food storage theories and methods. Applications of refrigeration and air conditioning in agricultural and dairy products processing and storage.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : ME 161 (Refrigeration Engineering) and
ME 162 (Air-Conditioning Engineering)

ME 290 THEORY AND DESIGN OF CONTROL SYSTEMS

Elements of feedback theory as basis for analyzing and designing automatic control systems. State space representation of systems, controllability and observability, stability, probability and random signals, correlation, autocorrelation, and spectral density. Modeling technique and design of controllers using digital and analog controllers.

Credit : 3 units (3 hrs lec)
Prerequisite(s) : ES 202 (Advanced Engineering Mathematics II) and
ES 203 (Advanced Engineering Mathematics III)

ME 298 SPECIAL TOPICS

Investigation of special topics dictated by student and faculty interests. Maybe repeated up to a total of six units.

Credit : 3 units
Prerequisite(s) : Consent of Instructor

ME 299 SPECIAL PROJECT

A project on mechanical engineering involving individual effort and formal written report.

Credit : 3 units
Prerequisite(s) : Consent of Instructor

ME 300 THESIS

Credit : 6 units
Prerequisite(s) : Consent of Instructor