The Master of Science (M5) in Manufacturing Engineering deals with production, manufacturing, and service systems. Manufacturing engineering focuses on engineering design, manufacturing processes and materials, and the management and control of man-made systems.

The Manufacturing Engineering program provides a unique and high quality engineering education to prepare students for innovation, creativity, leadership, and success. As a student in Manufacturing Engineering, you will learn product design and innovation using cutting edge 3-D modeling tools and computers; control the high-tech machine tools including robotics that make the product; apply system theory, quality control, and optimization to manage the production and service system; and compete in the global environment. Our curriculum also gives students the special opportunity of working in virtual distributed global teams on practical industrial problems. This valuable experience brings students unique skills that are in great demand by employers.

This program offers thesis, report, and coursework options. Students may further specialize within the major through selection of elective courses, and a concentration in Systems Engineering is available for students interested in qualifications in Systems Engineering. The manufacturing engineering graduate program is designed to help practicing engineers and managers with extensive engineering experience in manufacturing. It combines knowledge in engineering, the physical sciences, and business to prepare graduate students for better opportunities in manufacturing industries. The graduate program provides both technical and engineering management skills, combined with an advanced education for the global market. There are also opportunities of working on research projects with faculty members in the department and students will be well prepared for doctoral programs in manufacturing engineering.

**Admission Requirements**

Apply to the UTRGV Graduate College:

**Step #1:** Submit a UTRGV Graduate Application at www.applytexas.org. The university application fee of $50 ($100 for International Applicants) can be paid online by credit card or electronic check (in the online application). All application fees are nonrefundable.

**Step #2:** Register on the UTRGV Recommenders and Document Upload Webpage (www.utrgv.edu/gradupload). This is where you will request recommenders and upload program requirement documents, and where the graduate office will upload your transcripts. If you do not complete this step, we will not be able to process your application.

**Step #3:** Request your transcripts and other supporting documentation to be mailed to:

The University of Texas Rio Grande Valley
The Graduate College
Marialice Shary Shivers Bldg. 1.158
1201 W. University Drive
Edinburg, TX 78539-2999

- Bachelor’s degree in Engineering, Science, Computer Science, or Business.
- Undergraduate GPA of at least 3.0.
- Official transcripts from each institution attended (must be submitted directly to UTRGV).
- Letter of intent detailing professional goals and reasons for pursuing the graduate degree.
- Resume.
- GRE General Test. GRE test scores are valid for 5 years.

**Additional requirements for domestic applicants who attended foreign universities:**

- TOEFL or IELTS Language Proficiency Test with minimum scores: 550 on paper-based, 213 on computer based, or 79 on internet-based for the TOEFL; 6.5 for the IELTS. TOEFL and IELTS scores are valid for 2 years. For additional information, [click here](#).
- English translation of educational records.
- Transcript Evaluation by the Foreign Credentials Service of America (FCSA). For additional information, [click here](#).

**Additional requirements for international applicants:**

- TOEFL or IELTS Language Proficiency Test with minimum scores: 550 on paper-based, 213 on computer based, or 79 on internet-based for the TOEFL; 6.5 for the IELTS. TOEFL and IELTS scores are valid for 2 years. For additional information, [click here](#).
- English translation of educational records.
- Transcript Evaluation by the Foreign Credentials Service of America (FCSA). For additional information, [click here](#).
- Financial Documentation showing sufficient funds (minimum of $25,000) to cover all expenses (living and academic) for the first year of study. For additional information, [click here](#).
- Immigration documents, including a current copy of your valid passport. For additional information, [click here](#).

**Program Contact**

Program Director: Dr. Alley Butler
Phone: (956) 665-2534
E-Mail: alley.butler@utrgv.edu

**Deadlines**

<table>
<thead>
<tr>
<th>Domestic</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer I</th>
<th>Summer II</th>
</tr>
</thead>
<tbody>
<tr>
<td>International</td>
<td>July 1</td>
<td>November 15</td>
<td>May 1</td>
<td>June 1</td>
</tr>
<tr>
<td>International</td>
<td>June 1</td>
<td>November 1</td>
<td>March 1</td>
<td>April 1</td>
</tr>
</tbody>
</table>

www.utrgv.edu/grad
Program Requirements

Required Courses 9
One course from each of following three areas:

Quality
MANE 6311: Advanced Quality Control 3
MANE 6313: Design of Experiments 3
MANE 6315: Reliability Engineering 3
MANE 6319: Quality Management Systems 3
MANE 6399: Topics in Manufacturing Systems (for Quality Subjects) 3

Design
MANE 6323: Advanced Computer Aided Design 3
MANE 6346: Polymer Engineering 3
MANE 6357: Ergonomics 3
MANE 6365: Tool Design and Analysis 3
MANE 6368: Logistics Engineering 3
MANE 6369: Mold Design and Analysis 3
MANE 6375: Human Factors 3
MANE 6399: Topics in Manufacturing Systems (for Design Subjects) 3
MECE 6320: Fracture Mechanics 3
MECE 6321: Intermediate Composite Material Design 3
MECE 6322: Ceramic Materials Engineering 3
MECE 6362: Finite Element Analysis 3

Systems
MANE 6321: Robotics and Automation 3
MANE 6328: Dynamic System Modeling and Forecasting 3
MANE 6331: Advanced Manufacturing Planning and Control 3
MANE 6340: Operations Research and Analysis 3
MANE 6342: Decision Support Systems 3
MANE 6352: Manufacturing Systems Simulation 3
MANE 6380: Engineering Project Management 3
MANE 6399: Topics in Manufacturing Systems (for Systems Subjects) 3
MECE 6331: Intermediate Dynamics of Mechanical Systems 3
MECE 6332: Intermediate Mechanical Vibrations 3
ELEE 6330: Linear Dynamic Models 3
ELEE 6350: Microprocessor System Design and Applications 3

Choose one of the following options:

Thesis Option:
Elective Courses in Manufacturing Engineering 9

Free Electives 6
Six hours from business, manufacturing, mechanical or electrical engineering, computer science, or mathematics chosen with the consent of the student’s advisor.

Capstone Requirement
Thesis 6
MANE 7300: Thesis I 3
MANE 7301: Thesis II 3

Total graduate hours for degree: 30

Non-Thesis Option:
Elective Courses in Manufacturing Engineering 21

Free Electives 6
Six hours from business, manufacturing, mechanical or electrical engineering, computer science, or mathematics chosen with the consent of the student’s advisor.

Capstone Requirement
Written Comprehensive Exam

Total graduate hours for degree: 36
Course Descriptions

MANE 6190: Engineering Project [0-1] Special construction projects, research activities or supervised engineering studies. May be repeated for credit. Prerequisite: Consent of instructor.

MANE 6304: Industrial Cost Analysis [3-0] This course provides a background in quantitative techniques in Engineering Management with emphasis on industrial cost analysis models and techniques. Financial models and methods are discussed with emphasis on capital budgeting and topics related to advanced engineering economics. Valuation and reporting methods are reviewed. Basic costing practices are discussed along with cost modeling and control methods. Prerequisite: MANE 3337.

MANE 6308: History of Manufacturing [3-0] This course provides the student with an introduction to the evolution of manufacturing and manufacturing systems, as well as a look into the possible future. The course involves extensive reading assignments, presentations and projects. Prerequisite: Consent of instructor.

MANE 6311: Advanced Quality Control [3-0] Deming continuous improvements concepts, Q.C. 7-tools, basic problem solving procedures, control chart practice and applications, design of experiments and Taguchi methods. ISO 9000 and TQM will be introduced. Prerequisite: MANE 2332.

MANE 6313: Design of Experiments [3-0] Randomization and blocking, significance tests and confidence intervals, factorial designs, applications of factorial designs, model building with least squares, response surface methods. Prerequisite: MANE 2332.

MANE 6314: Maintenance Systems [3-0] The maintenance, repair, and remanufacture of products has not, until recently, been supported by a solid, scientific basis. In this course this deficiency is addressed and, via mathematical models and simulation, investigated. Prerequisite: Consent of instructor.

MANE 6315: Reliability Engineering [3-0] System level reliability, redundancy, maintainability, availability analysis and modeling, life testing, acceleration, parametric, and non-parametric models. Prerequisite: MANE 2332.

MANE 6319: Quality Management Systems [3-0] Introduces philosophies, tools and methodologies of TQM, quality systems (ISO 9000, ISO 14000, 6-sigma), bench marking, quality function deployment, Taguchi method, Failure Mode and Effect Analysis (FMEA) and management tools. Prerequisite: Consent of instructor.

MANE 6321: Robotics and Automation [3-0] Application of industrial robots and their role in industrial systems. Relationships among product design process control, robot kinematics and flexible automation are covered. Prerequisite: MANE 3302 or equivalent.


MANE 6328: Dynamic System Modeling and Forecasting [3-0] System identification using time series, Green’s function and stability analysis, forecasting, multiple series and applications for on-line
manufacturing process control. **Prerequisite:** MANE 2332.

**MANE 6331: Advanced Manufacturing Planning and Control [3-0]**
Forecasting, aggregate planning, inventory control, pull and push production systems, operations and project scheduling and recent advances in operations planning and control. **Prerequisite:** MANE 3364 or equivalent.

**MANE 6340: Operations Research and Analysis [3-0]**
Concepts in mathematical modeling, stochastic processes, queuing theory, linear programming, integer programming, dynamic programming, non-linear programming, and inventory models. **Prerequisite:** Consent of instructor.

**MANE 6341: Advanced Operations Research and Analysis [3-0]**
Concepts in mathematical modeling, stochastic processes, queuing theory, dynamic programming and non-linear programming. **Prerequisite:** MANE 6340.

**MANE 6342: Decision Support Systems [3-0]**
Engineering decision-making, sequential decision procedures, design of engineering systems, knowledge acquisition and representation, hybrid systems and engineering applications. **Prerequisite:** Consent of instructor.

**MANE 6343: Queueing Models for Manufacturing Systems [3-0]**
This is a course on the application of stochastic models and Queueing theory in design and control of manufacturing systems. We will start from review of elementary probability theory; we will then cover conditional expectation; the Poisson process; renewal theory; Markov chains; and queueing theory. Emphasis will be given to Queueing models and their application in manufacturing systems, transportation and stocking systems, and other types of service delivery systems. Student will be able to apply Queueing models in the design of these systems, and other types of service delivery systems. Student will be able to apply Queueing models in the design of these systems in terms of layout, capacities and control. **Prerequisite:** MANE 2332.

**MANE 6345: Engineering Management [3-0]**
Fundamental principles of planning, estimating, budgeting, scheduling, implementation, evaluation and controlling engineering and research projects. Common engineering management concerns such as labor scheduling, human resources management and related governmental compliance also explored. **Prerequisite:** Consent of instructor.

**MANE 6346: Polymer Engineering [3-0]**
Study of engineering properties of polymer materials and selection of polymers for use in engineering applications. Manufacturing properties of polymer materials and their effects on manufacturing processes. **Prerequisite:** MANE 3364 or equivalent.

**MANE 6347: Facilities Layout [3-0]**
An analytical approach to the planning and design of manufacturing facilities and material handling systems. **Prerequisite:** Consent of instructor.

**MANE 6348: Systems Engineering [3-0]**
Systems Engineering covers translation of customer needs into product requirements, management of the interface, and interaction of systems and subsystems. It also includes coordination of design reviews, analysis of alternatives, consideration of component testing and verification, within cost and schedule constraints. Additional issues include the interface with the human user, system reliability, logistic support, and system safety. This course discusses tools that help the Systems Engineer to complete complex projects with success. **Prerequisite:** Consent of the instructor.
MANE 6349: Advanced Work Science [3-0]
Design methods for work and work systems; scientific and engineering basis of work and its analysis. **Prerequisite:** Consent of instructor.

MANE 6350: Flexible Integrated Manufacturing [3-0]
Application of industrial programmable logic controllers, machine vision system, selection of tools for robot end effector, sensor technology, machine-human systems such as expert system and flexible automation system design. **Prerequisite:** MANE 3302 or equivalent.

MANE 6351: Intelligent Decision Systems [3-0]
This course provides an introduction to the methods and applications of the methods which form the basis of Intelligent Decision making via the employment of techniques from Artificial Intelligence (e.g., expert systems, neural networks, genetic algorithms, and self-organizing systems) and Operations Research (e.g., ontogenic neural networks, cluster analysis, discriminant analysis, and genetic search). Recent advances and applications are covered. **Prerequisite:** Consent of instructor.

MANE 6352: Manufacturing Systems Simulation [3-0]
Simulation and modeling of discrete-event systems, input data analysis, model development, model verification, validation, output analysis and applications to manufacturing. **Prerequisite:** MANE 2332.

MANE 6353: Optimizing Factory Performance [3-0] An introduction to the systems which comprise production lines, supply chains, and business processes and coverage of the models and methods employed to reduce unnecessary complexity and excessive variability within such systems. Introduction to new, improved performance metrics (e.g., LACTE) as employed in the pursuit of fast cycle time and significant, sustainable improvement. Both mathematical modeling and discrete simulation are employed in the analysis. **Prerequisite:** Consent of instructor.

MANE 6354: Advanced Engineering Economy [3-0]
Advanced techniques of engineering economic analysis; evaluation of alternative capital investments considering income taxes, depreciation and inflation; discounted cash flow analysis of competing projects, break-even analysis and determination of rate of return on investment, risk and uncertainty in engineering analysis. **Prerequisite:** MANE 3337.

MANE 6357: Ergonomics [3-0]
Functional anatomy and physiology of musculo-skeletal system and their applications in work design. Work physiology, manual materials handling, hand tools, and repetitive motions. **Prerequisite:** Consent of instructor.

MANE 6364: Advanced Manufacturing Processes [3-0]
The objective of this course is to obtain an understanding of some of the manufacturing processes used in industry today and to become familiar with some of the recent advances that have been made. This course focuses on specific manufacturing processes including heat treatment, metal forming, metal cutting, non-traditional processes, rapid prototyping and electronics manufacturing. The physical principles underlying the manufacturing processes are discussed and analyses of the process are conducted. **Prerequisite:** MANE 3364 or consent of the instructor.

MANE 6365: Tool Design and Analysis [3-0]
Fundamentals of different areas of tools used in manufacturing. Tool making, tool materials, cutting tools, locating and clamping, jigs and fixtures. Design of fixtures for numerical control machines and modular fixturing. **Prerequisite:** MANE 6323.
MANE 6368: Logistics Engineering [3-0]
Analysis of integration of support functions in the development, operations and maintenance of complex engine systems. **Prerequisite:** Consent of instructor.

MANE 6369: Mold Design and Analysis [3-0]
Design of injection molding molds, mold components and design of parts for effective injection molding. Analysis of mold filling, fluid flow, mold temperature, residual stresses and other factors that affect the quality of mold. **Prerequisite:** MANE 3300 or equivalent.

MANE 6372: Advanced Engineering Analysis [3-0]
Use of mathematical techniques to model and analyze problems encountered in engineering. Topics include linear algebra, ordinary differential equations, numerical methods and optimization techniques. **Prerequisite:** MANE 3351.

MANE 6375: Human Factors [3-0]
Methods of measurement of human performance, psychological and physiological background of human information processing, principles and techniques of display and information system design, human error and reliability. **Prerequisite:** Consent of instructor.

MANE 6380: Engineering Project Management [3-0]
Planning, scheduling and control of engineering projects, network models, CPM, PERT, resource allocation and time-cost tradeoff. **Prerequisite:** Consent of instructor.

MANE 6383: Analysis of Polymer Systems [3-0]
This course is intended for manufacturing engineers requiring an introduction to the experimental chemistry of plastics with experimental and measurement techniques and the interpretation and representation of the results. The operation principles of various analytical equipment and applications are discussed. **Prerequisite:** MANE 3364.

MANE 6384: Polymer Structures, Properties, and Applications [3-0]
This is an intermediate to advanced course in the relationship between polymer structure, properties, and applications that are of importance to manufacturing engineers working in the various manufacturing environment from automobile to aerospace industry. The difference in properties of various plastics and their structure is discussed. **Prerequisite:** MANE 3364.

MANE 6385: Plastics Product Design and Engineering [3-0]
This is an intermediate course in the plastics product design for injection molding process that is widely used to make from consumer product to aerospace application. The design principles and use of plastics to achieve competitive design of plastic parts is discussed. **Prerequisite:** MANE 3364.

MANE 6390: Engineering Project [3-0]
Special construction projects, research activities or supervised engineering studies. May be repeated for credit. **Prerequisite:** Consent of instructor.

MANE 6399: Topics in Manufacturing Systems [3-0]
Topics selected from current issues of concern in manufacturing industries. May be repeated for credit when topics change. **Prerequisite:** Consent of instructor.

MANE 7300: Thesis I [3-0]
First part of a two course sequence. **Prerequisite:** Graduate standing and consent of thesis advisor.

MANE 7301: Thesis II [3-0]
Second part of a two course sequence. **Prerequisite:** MANE 7300.

ELEE 6330: Linear Dynamic Models [3-0]
Introduction to linear dynamic systems; state-space analysis; stability theory; applications to feedback control; elements of optimal control.
ELEE 6350: Microprocessor System Design and Applications [3-0]
Microprocessor design fundamentals, design methods, interfacing, bus architectures, peripherals, embedded applications, development systems, software.

MECE 6320: Fracture Mechanics [3-0]
Development of the tools of linear and nonlinear fracture mechanics with coverage of theoretical considerations. The primary focus of the course is applications of tools to solution of practical problems in fracture prediction and failure analysis. Significant attention is paid to the phenomenology of fracture in metals, polymers, ceramics and composites. **Prerequisites:** Graduate standing in engineering.

MECE 6321: Intermediate Composite Material Design [3-0]
An introduction to the theory of mechanics of solids for elastic and viscoelastic composite materials. Emphasis on analysis and design of structural laminate composite including failure mechanism, e.g., fatigue, delamination and dynamics of composites including effective moduli and material damping. **Prerequisite:** Graduate standing in engineering.

MECE 6322: Ceramic Materials Engineering [3-0] A survey of the fundamental properties of ceramic and glass materials which are utilized in electronic, electro-optic, thermal and mechanical systems. Includes an introduction to the manufacturing processes specific to ceramics with an emphasis on their interaction with the design process. Probabilistic design schemes for mechanical components are covered and students perform a detailed component or process design. Several laboratory demonstrations and assignments are included. **Prerequisite:** Graduate standing in engineering.

MECE 6331: Intermediate Dynamics of Mechanical Systems [3-0] Intermediate dynamics, including Newton-Euler, Lagrange, and Hamilton’s principles; gyroscopic effects in mechanical systems; analysis of stability of systems; numerical simulation. **Prerequisite:** Graduate standing in engineering.

MECE 6332: Intermediate Mechanical Vibrations [3-0]
An examination of linear, multi-degree of freedom and continuous vibratory systems, both conservative and non-conservative. Free and forced vibration problems using generalized coordinates are also examined. **Prerequisite:** Graduate standing in engineering.

MECE 6362: Finite Element Analysis [3-0] An introduction to the theory of finite element methods, with application to stress analysis, natural frequency extraction and heat transfer. Strategies for meshing and applying boundary conditions are also examined. Existing codes are used for determining finite element solutions. **Prerequisite:** Graduate standing in engineering.