University of Technology, Jamaica
Faculty of Engineering and Computing (FENC)
School of Engineering

IE
Brochure

BACHELOR OF ENGINEERING IN INDUSTRIAL ENGINEERING

UNIVERSITY OF TECHNOLOGY, JAMAICA
INDUSTRIAL ENGINEERING
DEPARTMENT

ROAD TO RECOVERING JAMAICA'S SOLID WASTE MANAGEMENT SYSTEM

PRODUCTIVITY INNOVATION

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While high focus is placed on industries such as tourism and construction, and their contributions to economic growth, little has been given to Solid Waste Management. Materials recovery has been proven to help boost economies around the world and is worth exploring here in Jamaica.

A Materials Recovery Facility (MRF) is a facility that utilizes a combination of machinery and human effort to sort and densify waste. Recoverable materials can be sold for a profit.

Based on recent study, a proposed MRF with a design capacity of 1275 tons per day (TPD) and an actual throughput of 1020 TPD would directly employ 218 Jamaicans. Another study estimates the annual revenue of such a facility to be JA$408 million.

	Revenue	Employees	Productivity*
NSWMA	530 M	4,214	0.13 M
MRF	408 M	218	1.87 M
Both	938 M	4,432	0.21 M

**Productivity per employee. Revenue in millions (JMD).*

An average MRF can produce 245 tons per day of throughput at a 65,400 sq.ft. plant with just 27 sorters. This results in a productivity of 9.8 tons per day per employee.

1,572
New job creation across the Jamaican economy

JA $3.7 Billion
Contribution to the Jamaican economy

Going Green
Reduced water consumption, negligible gas, odor, dust and substance emission

University of Technology, Jamaica

Mission Statement

"To positively impact Jamaica and the wider Caribbean through high quality learning opportunities, research and value-added solutions to government, industry and communities".

University's 2025 Vision

"We are the # 1 University in the Caribbean for work-ready leaders, committed to transforming students and society through high quality teaching, research and value-added services".

UNIVERSITY OF TECHNOLOGY, JAMAICA
INDUSTRIAL ENGINEERING
DEPARTMENT

Mission Statement

"To positively impact Jamaica and the wider Caribbean through high quality learning opportunities, research and value added solutions in Industrial Engineering to government, industry and communities".

IE's 2025 Vision

"The Industrial Engineering (IE) Department at the University of Technology, Jamaica will be in the top 5 Engineering programs for IE in the Caribbean for work-ready leaders, committed to transforming students and society through high quality teaching, research and value-added services".

BACHELOR OF ENGINEERING IN INDUSTRIAL ENGINEERING

PROGRAMME DESCRIPTION

The Bachelor of Engineering in Industrial Engineering (BEng. IE) Course of Study enrolled its first batch of students at the start of the academic year 2008/9. Eight (8) students were enrolled at the time and in 2012, five (5) students, of the eight (8), graduated. The average enrolment in the programme since its inception currently stands at approximately nineteen (19) students per year. Over the past four (4) years, the programme has been able to maintain an average enrolment of approximately 80 students across all levels per year. It is almost safe to say that the total enrolment numbers in the BEng IE Course of Study has settled. Notwithstanding, the BEng IE Course of Study has not had any major review since its inception. This revision therefore represents the most substantive revision of the programme since it started in 2008.

The review is guided by four main inputs, to include the most recent report (2018) from the programme's external examiner namely Professor Asfour of the University of Miami (See Appendix A), feedback from the recently concluded review of the programme by the University Council of Jamaica (see Appendix B), which accorded accreditation status to the programme, feedback from the BEng IE programme's Advisory Board (see list of Advisory Board members in Appendix C) and general feedback from employers of our graduates and internal stakeholders. We are therefore assured that the changes being recommended are (a) consistent with developments in the field of Industrial Engineering, (b) aligned to the requirements of our local industry, (c) compliant with the requirements of our national quality assurance system and (d) has the support of our internal stakeholders.

DELIVERY & METHODOLOGY

The offering of all programmes is based on a combination of laboratories, classroom and project- based learning, as well as industry exposure. The general methodology is student-centered, outcomes-based learning, in which the students are presented at the start of each module with the learning objectives and are encouraged to do additional reading and research to supplement the instructional components.

PROGRAMME ASSESSMENT

A combination of analytical and laboratory work are designed to familiarize students with experimental equipment and procedures, and develop an understanding of the relationships of theory, experimental work and practices. All modules are assessed using a combination of the following; assignments, projects and final examinations. Students are provided with a copy of their course outline at the beginning of each module which includes the module and the schedule of content delivery, topics, assessment weightings and recommended text books.

CAREER OPPORTUNITIES

Graduates typically gain employment in the following areas: Manufacturing, Mining, Business Process Outsourcing, Banking Services, Airlines, Transportation/ Logistics, Power Utilities, Healthcare Systems, Publishing, Amusement Parks, Space Systems, etc.

PROGRAMME ALUMNI

Banking Services

Power Utilities

Transportation and Logistics

ENTRY REQUIREMENTS

Five (5) CSEC/O'Level subjects: English Language, Mathematics, Physics, Chemistry and One (1) other (Technical) subjects **and** GCE A'Level Mathematics, Physics, **or** four (4) CAPE Units including Physics Units I and II and Mathematics Units I and II. See Appendix D for more information on common first year for engineering students along with entry requirements. Interviews will be conducted on a case be case basis as deemed necessary by the Programme Director.

Articulation

There will be two points of access to the BEng. IE course of study from the Diploma programme:

- At the end of the first year of the Diploma programme with a minimum GPA of 3.00, will be offered the opportunity to transfer into the first year of the course of study (an interview may be required, depending on the GPA).

- Students may also transfer into the programme after completing the Diploma in Mechanical or Electrical Engineering. Entry will be into the 2nd year of the course of study dependent on a minimum GPA of 2.7 (an interview may be required)

PROGRAMME OBJECTIVES

The Bachelor of Engineering in Industrial Engineering Course of Study is designed to enable students - during the first few years after their graduation – to be able to:

1. Think creatively in applying mathematics, basic sciences, and engineering principles in the design, analysis and synthesis of engineering systems.

2. Be proficient in the use of contemporary industrial engineering tools to design and analyse engineering systems, products and processes.

3. Demonstrate the ability to clearly exercise various forms of engineering communications (i.e. written, oral, graphical and electronic).

4. Determine the most effective ways to utilize basic resources of people, machines, materials, financial assets, information and energy in optimizing the productivity and quality of industrial processes.

5. Prepare for leadership roles in a global environment.

6. Fulfil the requirements for membership and/or registration in professional engineering organisations in Jamaica (PERB), the Caribbean region, and internationally.

7. Demonstrate an understanding of the professional, social, environmental and ethical responsibilities of the industrial engineer in society.

COURSE STRUCTURE

Level 1

General Objectives:

Upon successful completion of this year, students will:

- Be aware of the various tools used by engineers.
- Exhibit competence in the different modes of communications employed by engineers (written, oral, graphical)
- Understand the mathematics and basic science behind the fundamental engineering principles and technologies.
- Understand the role of the engineer in society.

School/Dept.		Module Code	Module Title		Contact Hours/Week		Credit Hours
					Lecture	Lab/Tut	
SEMESTER 1	SHSS	COM1020	Academic Writing 1		2	0	3
	SoMaS	MAT2018	B.Eng Maths 1- Calculus 1		3	0	3
	SOE	ECE1002	Engineering Computing		2	3	3
	SoMaS	PHS1005	Engineering Physics 1		3	3	4
	Library	LIB1001	Library Fundamentals		0	3	1
	SOE	ENG1008	Introduction to Engineering		3	0	3
	SCIT	CSP1001	Community Service Project		0	3	1
				Subtotal	13	9	18
SEMESTER 2	SOE	ENG1001	Engineering Graphics		0	3	1
	SoMas	MAT2022	B.Eng Maths 2		3	0	3
	SoMas	CHY2022	General Chemistry 2 (Lab)		0	3	1
	SoMas	CHY2021	General Chemistry 1		3	0	3
	SOE	ENG1005	Engineering Workshop		1	3	2
	SOE	ECE1003	Electrical Technology		2	3	3
	SOE	MEE2008	Engineering Statics		3	0	3
				Subtotal	12	12	16
Cumulative Credit Hours							
Year 34 **(No Change of Credit)** **Programme 34**							

Level 2

General Objectives:

Upon successful completion of this year, students will:

- Understand how to relate drawing to design
- Have exposure to engineering disciplines
- Exhibit competence in the analysis of appropriate engineering models both mathematically and experimentally.
- Sharpen his/her communications skills through seminar presentations.

	School/Dept.	Module Code	Module Title		Contact Hours/Week		Credit Hours
					Lecture	Lab/ Tut	
SEMESTER 1	SOE	ENG2006	Engineering Drawing & Design		2	3	3
	SoMaS	MAT3004	B.Eng Maths 3		3	0	3
	SoHaS	COM2014	Academic Writing 2		3	0	3
	SOE		Programming for Industrial Engineers		2	3	3
	SOE	ENT3001	Entrepreneurship		3	0	3
	SOE	ENG1006	Engineering Seminar		2	0	1
				Subtotal	15	6	16
SEMESTER 2	SOE	MEE3038	Control Systems		2	3	3
	DOLS	POM3010	Operations Management		3	0	3
	DOSM	STA2023	Engineering Statistics		3	0	3
	SOE	MEE2003	Materials Science		2	3	3
	SoMas		Linear Algebra		3	0	3
	SOE		Manufacturing Systems		3	0	3
				Subtotal	16	6	18
Cumulative Credit Hours							
Year 34 (No Change of Credit)							
Programme 68							

Level 3

General Objectives:

Upon successful completion of this year, students will:

- Exhibit depth of knowledge in some industrial engineering sub-disciplines
- Understand the basic concepts related to manufacturing and service organisations.
- Apply methodologies to analyse systems and their operations
- Know how to analyse systems cost.
- Understand the importance of quality in a global economy.

School/Dept.		Module Code	Module Title		Contact Hours/Week		Credit Hours
					Lecture	Lab/Tut	
SEMESTER 1	SOE	INE	Operations Research I		2	3	3
	SOE	ENG3011	Engineering Economics		3	0	3
	SOE	INE	Supply Chain and Logistics Engineering		2	1	3
	SOE	INE	Business Process Engineering and Analytics		3	0	3
	SOE	CMP3004	Computer Aided Design & Manufacturing		2	3	3
	SOE	INE	Quality Control & Management		3	0	3
				Subtotal	16	3	18
SEMESTER 2	SOE	INE3004	Facility Planning & Design		2	3	3
	SOE	MEE3008	Manufacturing Processes		2	3	3
	SOE	INE3005	Work Measurement & Design		2	3	3
	SOE	INE4003	Ergonomics		2	3	3
	SOE	INE	Operations Research II		2	3	3
	SOE	MEE3010	Project Management		3	0	3
				Subtotal	13	15	18
Cumulative Credit Hours							
Year 36 (An Increase from 34 Credits)							
Programme 104							

Level 4

General Objectives:

Upon successful completion of this year, students will:

- Show competence in integrating different aspects of engineering through designs and project.
- Exhibit competency in analyzing industrial systems.
- Learn how to identify, formulate, simulation and solve systems engineering problems.
- Develop skills in research, planning, designing, management and control of industrial systems.

School/Dept.		Module Code	Module Title		Contact Hours/Week		Credit Hours
					Lecture	Lab/ Tut	
SEMESTER 1	SOE	PRJ4029	Major Project 1: Research Methods		2	0	3
	SOE	INE4001	Introduction to Simulation		2	3	3
	SOE	ENG4016	Management for Engineers		3	0	3
	SOE	PRJ4023	Management of Technology		3	0	3
	SOE	ENG4010	Industrial Work Experience		0	2	2
	SOE		Specialisation Elective 1		2(3)	3(0)	3
				Subtotal	12(13)	8(5)	17
SEMESTER 2	SOE	INE4010	Organizational Behaviour & Leadership		3	0	3
	SOE	PRJ4030	Major Project 2: Design and Build		1	3	3
	SOE		Technical Elective		2(3)	3(0)	3
	SOE		University Elective		3	0	3
	SOE		Specialisation Elective 2		2(3)	3(0)	3
				Subtotal	11(13)	9(3)	15
Cumulative Credit Hours							
Year 32 (A Decrease from 36 Credits)							
Programme 136							

Electives

Specialization and Technical Electives

The table below provides a full list of technical and specialization electives to be offered in the Industrial Engineering Course of Study. It is expected that providing a list with a greater possibility of offering said modules will increase the confidence students have in our offerings as they complain extensively about having certain modules on the slate of electives that are not offered.

Manufacturing	Engineering Management	Technical Elective
• Advanced Manufacturing Processes	• Maintenance Engineering & Management	• Energy Management
• Introduction to Robotics	• Management Information Systems	• Introduction to Safety and Reliability Engineering
• Design for Manufacturing	• Operations Management 2	• Information Systems
• Energy Management	• Energy Management	• Design of Experiment • Financial Engineering • Introduction to Software Engineering

Students must select a total of four (4) electives **as follows:**

Two **(2) Specialization electives from:**

either **the** Manufacturing **group,**
or **the** Engineering Management **group of modules in the table above.**

One (1) technical elective selected from the table above

One (1) University elective as per offering.

Module Descriptions

Semester I - Year I

Academic Writing 1- COM1020

This module is designed to increase the students' capacity to efficiently utilize receptive and expressive language skills in order to function effectively within various English Language contexts. There is a heavy focus on the inter-related language skills: reading, listening and writing. The module is divided into three units: Acquiring and Processing Information, Message Production in Academic Contexts and Message Production for Business Purposes. Although each unit has its own focus, all three are inter-related and each is meant to reinforce the other.

B. Eng Maths I – Calculus I- MAT2018

In this module students will be introduced to intermediate aspects of calculus. These include advanced optimization applications of differentiation using lagrange multipliers, MacLaurin's theorem, and evaluation of double integrals. This module helps the students to understand the concepts and demonstrates applications in the theory of linear algebra.

Engineering Computing- ENG1008

In this module the student is introduced to the various concepts of electrical engineering that are important to mechanical engineers. Linear circuit theory and electronics are introduced. Both direct and alternating current circuits are examined.

Engineering Physics I- PHS1005

This syllabus is designed to build on the physics base established in the PCS programme. The topics are treated at an advanced level with emphasis on the understanding and application of physical concepts and principles.

Introduction to Engineering- ENG1008

This module is design to give students an overview of the engineering profession. The emphases of this module are directed towards engineering principles which cuts across all engineering professions and are enduring in their influence and usefulness. Topics include: what is engineering, history of engineering, problem solving, engineering communication, and the introduction to some of the tools used in engineering. Problem solving techniques are also emphasized.

Community Service Project- CSP1010

This module covers the importance of volunteerism in contributing to an improvement in the quality of life in communities around UTech and Community Colleges which deliver its programmes as well as the wider society. It further unites classroom instructions with real societal needs and explores the relationship between General Education modules and CSP1010.

Library Fundamentals- LIB1001

The module is designed at enabling and increasing in students the capacity to efficiently use the library and to equip them with the skills to deal with the Information Age. It will assist them in coping efficiently and effectively with the continuous growth of information and the technologies to harness the relevant information sources in whatever format (print, electronic, also weather it is found in books, journals or in multi-media.) that it exits.

Semester II - Year I

Engineering Statistics- ENG2008

The module considers the effect of forces on particles and rigid bodies in mechanical equilibrium. Students will sharpen their mathematical skills in vectors and linear algebra. Active and reactive forces, both concentrated and distributed are considered. Also considered are trusses, beams, composites, friction and inertia. Concepts will be applied to designing, constructing and testing a physical structure.

General Chemistry I- CHY2021

This module is designed to introduce the student to some of the fundamental concepts required in the study of Chemistry and is a blend of physical and inorganic chemistry. It includes ten (10) units; starting with the Foundations of chemistry, then taking a close look at the structure of the atom, periodic trends, rates and energy changes of chemical reactions and electrochemistry. The module provides a springboard for other more advanced chemistry modules.

General Chemistry 2- CHY2022- *Lab component to General Chemistry I.*

This module is designed to introduce the student to the group and first-row transition elements of the periodic table, and to provide the fundamentals of organic chemistry. It includes ten (10) units and forms the basis for other more advanced modules in chemistry.

Engineering Graphics- ENG1001

This module develops the student ‘s competence in the different skills of descriptive geometry and engineering drawing in order to raise the awareness and the need of engineering drawing in the design and technology field. Upon successful completion the student should be able to interpret engineering drawings, draw simple engineering diagrams and schematics according to appropriate standards, and utilise this information in designing components. Lecture classes will be conducted to explain concepts, techniques and basic principles. The use of computer aided drafting packages such as AUTOCAD is an integral part of this module.

Engineering Workshop- ENG1005

Engineering workshop plays a critical role in the design, fabrication and carrying out repairs effectively and safety to various engineering components. As such this module focuses on the safe and effective use of the workshop and the tools and equipment within. It focuses both on the electrical and mechanical workshops which are inherently different and introduce the student both to an Electrical and Electronic workshop and a Mechanical workshop.

BEng. Maths 2- MAT2022

Many engineering systems may be modelled by either ordinary or partial differential equations. The engineering students must therefore obtain competence in solving and interpreting the results of these equations. The aim of this module is to introduce the students to the various standard techniques used for solving differential equations. Various engineering problems will be used as illustrated examples.

Semester I - Year II

BEng. Maths 3- MAT3004

In this module students will be introduced to Laplace transform and Fourier analysis. It helps the students to develop mathematical skills to analyse signals and systems using transform techniques**.**

Engineering Seminar- ENG1006

Significant importance has been given to seminars. Besides subject specialists, who will be invited to discuss topics of interest, every student will be required to write a report on an engineering topic and hold a seminar on it. This is aimed at increasing the communication skills of the student.

Programming for Industrial Engineers

This module provides an introduction to IT based tools that will support data analysis and visualisation for students in Industrial Engineering. It seeks to establish the groundwork for basic coding activities that will support existing programming knowledge. The primary content covered include Python, R and advance Spreadsheet.

Academic Writing II- COM2014

Academic Writing II covers skills in critical thinking and reading, information gathering, documentation and argumentation. It focuses on developing reasoning and problem solving competencies and demands the effective use of both receptive and expressive skills.

Engineering Drawing & Design- ENG2006

In this module the mechanical engineering student is exposed to the fundamentals of the design process and also introduced to some of the standard manufacturing equipment. Several factors are a part of this process: analysis of stress, manufacturing process, material selection, ergonomics and aesthetics, the process (inverse or direct), the concepts of synthesis and redesign. Some lecture classes will be conducted to explain concepts, techniques and basic principles. The use of computer aided drafting packages such as AUTOCAD is an integral part of this module.

Entrepreneurship- ENT3001

This module guides students through the process involved in creating a new business. It begins by introducing the concepts of entrepreneurship and intrapreneurship and culminates with the development of a business plan. It covers topics ranging from idea generation and marketing, through to the legal aspects of business. The module seeks to demystify the process of starting and operating business, by exposing participants to a systematic approach to business development, with the aim of increasing the number of persons who see business creation as a viable alternative for employment and contribution to society.

Semester II - Year II

Material Science- MEE2003

The Material Science module deals with the microstructures and properties of common engineering materials, and subsequent environmental effects. The module provides the student with an insight into the analysis of engineering materials sufficient to understand the factors governing material selection and its importance to design and failures of systems and components.

Operations Management- POM3010

This module introduces the students to the functional area of production and operations management as practiced in manufacturing industries and the services sector. In addition to exposing students to the strategic role of operations management in an organisation, specific tools and techniques for managing the operations function will be introduced. Students will be able to explain how operations management can provide a company with a competitive advantage and will be able to apply various techniques to the management of a firm's operations function.

Engineering Statistics- STA2023

Students are introduced to basic probability and statistics. Emphasis is placed on experimental design and quality control. The practical applications to engineering are highlighted.

Manufacturing Systems- MEE3040

This module examines the application of systems analysis and industrial engineering to the design, planning, and analysis of manufacturing systems. Principal topics include group technology and cellular manufacturing systems, just-in-time, flexible manufacturing systems and optimization strategies for discrete parts manufacturing. Elements of systems and their interaction with each other will also be assessed. The concept of lean will be integrated into the analysis of these systems. Lean Manufacturing is the systematic elimination of waste, and the implementation of continuous flow concepts and customer pull. Lean is the best management system for satisfying customers on delivery, quality, and price. Lean Manufacturing tools and methods such as Kaizen, Kanban systems, 5S, TPM, TQM among others.

Linear Algebra- MAT1043

In this module students, will be introduced to aspects of Linear Algebra that are relevant to the disciplines of Statistics, Economics and Computing. Several applications of Linear Algebra will be explored, and the techniques of rigorous proof will also be introduced.

Semester I - Year III

Supply Chain and Logistics Engineering

The module provides a framework for students to understand the flow of products, information, and money throughout the supply chain. Emphasis will be placed on the study of logistics engineering as a total system approach to include all elements of logistics design and support component. Governing principles and practices will be adequately covered, in addition to topics such as Logistics Cost and Performance, Logistics in System Design and Development and Supply Chain Integration.

Operations Research 1

This module introduces methods and techniques of optimizing and analysing industrial operations using basic tools and classical deterministic models. This is a first in a two-part sequence. Topics include: Overview of operations modelling. Graphical solutions to linear programming. Simplex linear programming; Duality theory and sensitivity analysis. Applications of duality. Dual simplex method. Applications to assignment, transportation and waiting line problems. Computer solutions using linear programming software.

Business Process Engineering

This module provides students with the necessary insights into critical aspects of business process and the basis for students to appreciate important concepts in business process engineering and reengineering. Emphasis is placed on identifying, categorising, classifying and decomposing a process. Process mapping schemes, trends, technology and automation are topics that are included in this module.

Computer Aided Design and Manufacturing- CMP3004

The computer has become an important tool in engineering design. This module provides students with the fundamentals in computer aided design and manufacturing, and its relationship to the design process. This ensures that students are aware of the capabilities and limitations of computer-based tools for engineering design and analysis. Projects will focus on design application, and hands-on experience in the use of CAD/CAM software packages. Topics include CAD hardware, geometric modeling, engineering analysis, design optimization, computer-aided manufacturing, and rapid prototyping.

Quality Control and Management- INE3007

Quality control is ensuring product conformance to establish standards. Reliability is the probability that a product will perform its intended function without failure under specified conditions, for a specified period of time. Therefore, in this module students will be exposed to some of the methods and activities involve in controlling quality and the key principles of reliability. It focuses on the use of statistics in quality control and gives the student an overview of the history and philosophies of quality and the importance of quality in having satisfied customer. It also focuses on the role that reliability plays in ensuring that a design product will perform to its design specification.

Engineering Economics- ENG3011

In this module, engineering students are introduced to the main concepts in economics studies and their relationship with various aspects of engineering design and Manufacturing operations at various contexts. Topics relating to optimization are also introduced in this module.

Semester II - Year III

Facility Planning and Control- INE3004

This module provides an overview of the principles and practices in layout and materials handling. Concepts are applied through laboratory projects. Topics include product development; determining optimal location of plant and services; materials flow; plant and materials handling layout; analytical and computerized techniques to generate layout designs; materials handling fundamentals; materials handling equipment; requirements and selection of machines and labour; facilities requirements and building and support equipment.

Ergonomics and Human Factors Engineering- INE4003

Ergonomics is the science of designing machines, products and systems to maximize the safety, comfort and efficiency of the people who use them. It is the means by which people and machines work together as one unit. Ergonomics focuses on complementing the strengths and compensating for the weaknesses of each component within the system, both human and mechanical.

Manufacturing Processes- MEE3008

This module provides information on the main techniques for processing metals and non-metals and the interaction of process and material in design for each of the main class of materials. Topics include: Testing of Engineering Materials; Overview of the Manufacturing Systems; Power Metallurgy & Ceramics; Processing of Polymers; Coating & Deposition Processes; Casting and Welding & Joining.

Operations Research 2

This module extends operations research methods and techniques of optimizing and analysing industrial operations using classical deterministic and stochastic models. This is the second in a two-part sequence. Topics: Integer programming. Dynamic programming. Network analysis: critical path method (CPM/PERT) Markov processes. Queuing theory. Applications to queuing and inventory modelling, replacement and repair. Use of linear programming software.

Work Measurement and Design- INE3005

This module focuses on the methods used to improve productivity and efficiency in the work environment relating to jobs, human/machine systems, tools for people, and personnel systems to support operations. Topics include: Definition, development and scope of motion and time study; method study charting and diagrammatic techniques; Human factors consideration; Determination of time standards: direct time study, work sampling, indirect measurement; performance rating, allowances, normal and standard times; Computerized work measurement; Labour standards and wage incentive schemes; Productivity improvement and learning curve.

Project Management- MEE3010

This module focuses on the planning, scheduling, organizing, and controlling of projects. Projects may involve product development, facility construction, system installation, new business ventures, production layout, or organizing special events. The module integrates the major topics of strategy formulation, organisational structure, project management tools and leadership. As project management becomes increasingly more important in today's world, mastery of its' key tool and concepts is essential in maintaining a competitive advantage in the marketplace.

Semester I – Year IV

Industrial Work Experience- ENG4010

Students must have completed 2nd year engineering modules prior to their placement. Additionally, student must have attended at-least four (4) Employee Empowerment Sessions put on by Career and Placement Unit of the University.

Management for Engineers- ENG4016

The objective is to deliver a course of lectures to the students on selected important aspects and areas of Management and Planning. The module must expose them to the existing body of knowledge in the areas of management, organisational theory, marketing, production management, and project planning.

Management of Technology- ENG3017

The module introduces students to the competitiveness of the manufacturing and service enterprises in the global market place and the creation of wealth through technology. Topics include: Impact of the rate of change in technological development, integrating technological planning with business planning, technology and product life cycles, technological innovation, research and development management, technology transfer.

Introduction to Simulation- INE4001

In this module, students are exposed to quantitative methods that can simulate the system of interest, such as queuing networks manufacturing. In many cases actual experiments may be too costly or time consuming. The goal of simulation in this module is to create a mathematical model in which it is possible to obtain the information rather than by actual experience. Topics: Simulation and random events. Mote Carlo techniques. Methods of constructing simulation models. Design of simulation experiments. Output data analysis. Statistical techniques for comparing alternative models. Verification and validation of models. Spreadsheet simulation. Simulation programmes and languages including SLAM and SIMAN

Major Project 1: Research Methods- PRJ4029

This module introduces the currently accepted quantitative and qualitative methodologies necessary to enhance the skills and knowledge needed to plan and carry out research for Major and Senior Engineering Projects. It further, equips the participants with the tools necessary to critically assess research methods used for Engineering and Scientific inquiry and to facilitate the development of practical skills necessary for critically analyzing different research styles. This module combines lectures and tutorials in a manner that emphasizes practical application. There is no final examination.

Semester II – Year IV

Major Project 2: Design & Build- PRJ4030

This module introduces the currently accepted quantitative and qualitative methodologies necessary to enhance the skills and knowledge needed to plan and carry out research for Major and Senior Engineering Projects. It further, equips the participants with the tools necessary to critically assess research methods used for Engineering and Scientific inquiry and to facilitate the development of practical skills necessary for critically analyzing different research styles. This module combines lectures and tutorials in a manner that emphasizes practical application. There is no final examination.

Organisational Behaviour & Leadership- INE4010

Dynamic environments need leaders who challenge themselves to discover and test new ways to be effective. This module examines a variety of methods to manage and lead people in complex organisations and design workplaces that elicit high performance from individuals, teams, and organisations.

ELECTIVE MODULES

Introduction to Robotics

This module provides an overview of the principles and fundamental skills in the use and control of manipulation. Topics: Principles of robot kinetics and dynamics. Control systems: analysis of , sensors, actuators, transmission system. Drive methods: hydraulic, pneumatic, DC electric, stepping motors. Robot sensors: transducers, tactile, proximity and range sensors. Control of robots. Robot work cell and design. Robot programming and languages: methods of programming, motion interpolation, robot languages. Economic analysis for robotics. Machine vision. Robot safety and training. Industrial robot applications: materials handling, welding, spray painting, assembly, inspection and testing.

Design for Manufacturing

This module continues to provide the student with the competencies required in the design process. The student is exposed to (1) the effect that material selection, manufacturing processes and assembly procedures affect design and (2) the art of developing high-quality products at the lowest manufacturing cost. Topics: Design processes and methods. Selection of materials, forms of supply, application of materials. Design consideration in manufacturing processes: casting, forming, machining, heat treatment, joining, surface treatments. Cost evaluation. Assembly procedures, mass production and standards. Design codes. Ergonomics consideration.

Maintenance Engineering & Management

The module provides students with the knowledge to organise maintenance functions in the most effective way in order minimise maintenance and costs. Topics: Theory and practice of maintenance. Types of maintenance: corrective, preventive and predictive. Investigation of accidents and failures. Managing maintenance operations: facilities, custodial functions, equipment. Scheduling, organisation and control. Cost and benefit analysis. Concept of total productive maintenance. Computer application in maintenance.

Energy Management

This module exposes the students to energy management in residential, commercial and up to medium sized industrial facilities. This is achieved through the identification of energy saving opportunities through energy efficiency improvement, and energy consumption reduction. Strategies for energy monitoring of set performance indicators and periodic reporting of results are determined to ensure proper energy management results.

Design of Industrial Experiment

This module exposes students to Design of Experiment (DOE) as a methodology used to optimize industrial processes. Students will be taught how to set-up, conduct, and analyse the results of Full Factorial, Fractional Factorial, and Response Surface experiments utilizing manual and software applications. Additionally, they will receive an overview of Robust DOE, including the Taguchi method.

Advanced Manufacturing Processes

This module introduces the students to advanced material processes and technologies commonly employed. Topics include: Analysis of metal cutting, theory, cutting tools, force & power requirements, tool life and rate of metal removal; Economics of metal cutting; Fundamentals and analysis of forming; Assembly and Automation; Special machining operations; Processing of electronic circuits; Surface treatments and finishing processes.

Maintenance Engineering & Management

The student will learn the theoretical, statistical, practical, and the logical, treatments of industrial maintenance. In addition, the student will be exposed to organisational management and quantitative techniques used in maintenance.

Introduction to Safety and Reliability Engineering

This module introduces the students to what is required to ensure safety and reliability in today's commercial, industrial and public sector environments. It is based on the recognition that the performance of a complex system is affected by engineering inputs that begin at conception and extend throughout its lifetime.

Introduction to Software Engineering

Software Engineering is a core discipline of Computer Science. This module is the first of three (3) modules in Software Engineering. It exposes students to basic concepts and methods of software development using the team philosophy. The module provides an overview of the software development process followed by a detail study of the Requirement Analysis and Specification Process.

Management Information Systems

The aim of this module is to provide students with an understanding of the concepts and applications of information systems in order to prepare future managers to use information systems to meet their organization needs. In a computer-driven information age, managers need to know what information systems resources are available and how to determine the information systems need in the organization.

Information Systems

The aim of this module is to provide students with an understanding of the principles of computer-based information system. In a computer-driven information age, students need to know what information systems resources are available, how to determine the information systems need in an organization, and how to design and implement information systems.

Operations Management 2

This module is a continuation of the Operations Management module covered in Semester 1. It will build on the principles taught in that Operations Management 1 as well as introduce the students to new areas in the strategic role of operations management. Students will be able to explain how operations management can provide a company with a competitive advantage, and will be able to apply various techniques to the management of a firm's operations function.

Introduction to Financial Engineering

The module provides students with a basic appreciation for the highly technical field of financial engineering. Students will be exposed to the fundamental principles of finance, risk and economics. Students will also be exposed to the application of stochastics, simulation, mathematics and statistics in modelling financial problems. The intention is to prepare students to be able to initiate further studies in financial engineering.

PROFESSIONAL SOCIETIES/ STUDENT CHAPTERS

INSTITUTE OF INDUSTRIAL & SYSTEMS ENGINEERS

sme

Society of Caribbean Industrial Engineers

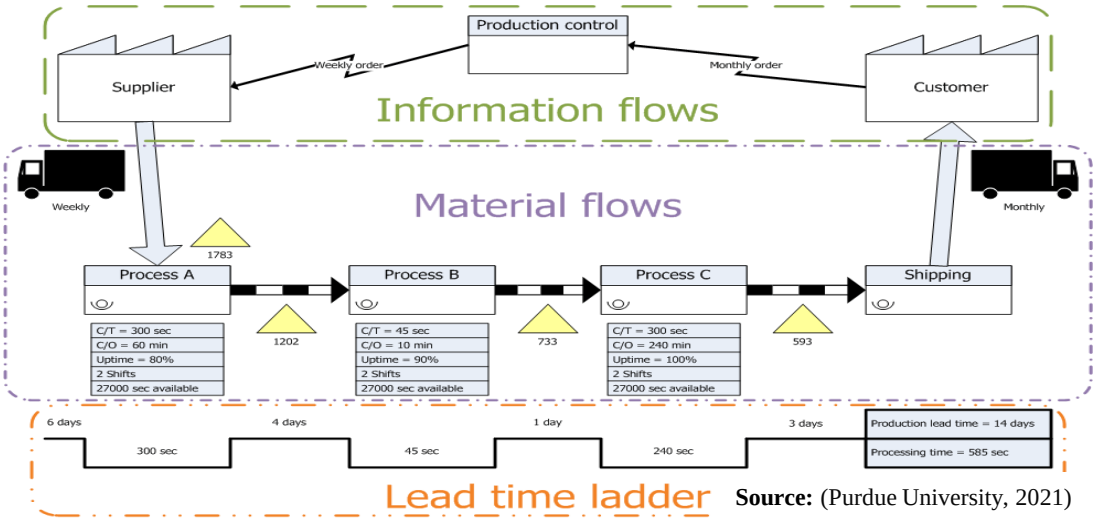
"Bringing prosperity to the Caribbean Region through Efficiency, Productivity and Innovation"

JAMAICA INSTITUTION OF ENGINEERS

IISE Body of Knowledge

Value Stream Map

What is a Value Stream Map (VSM)? "VSM is a workplace efficiency tool designed to combine material processing steps with information flow, along with other important related data. VSM is an essential lean tool for an organization wanting to plan, implement, and improve while on its lean journey. VSM helps users create a solid implementation plan that will maximize their available resources and help ensure that materials and time are used efficiently" (American Society for Quality, 2021)



Source: (Purdue University, 2021)

A relentless barrage of *'Why's'* is the best way to prepare your mind to pierce the clouded veil of thinking caused by the status quo. Use it often.

Shigeo Shingo

Management of a system requires knowledge of the interrelationships between all of the components within the system and of everybody that works in it.

W. Edward Demming

UNIVERSITY OF TECHNOLOGY, JAMAICA

INDUSTRIAL ENGINEERING

DEPARTMENT