UNIVERSITY OF TECHNOLOGY, JAMAICA

Excellence Through Knowledge

Faculty of Engineering and Computing

School of Engineering

Chemical Engineering

Brochure

Jelly Coconut Husk as a Thermal Insulating Material in Jamaica

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Introduction

Disposal of jelly coconut husks after industrial processing results in high economic loss to the manufacturer, as well as impacting the environment negatively. In this regard, considering the use of jelly coconut husk is essential as this could add profitability to the business and avoid environmental issues that may arise. Environmental issues of the coconut jelly husk may include the excess build-up of waste and shedding of small dander-like pieces which can clog irrigation and drainage lines.

Materials

Materials:

Coconut husks gathered from local producers and Jelly-men, Distilled water, tapioca starch,

Apparatus:

Electric Oven, knife, flathead screwdriver, 250ml beakers, 1in outer diameter PVC pipes, hacksaw, vice clamp, G-clamp, zip ties

Methodology

Board Preparation

PVC pipes with internal diameters of 1in were split length wise.

Coconut husks were gathered, the fibers pulled and cut to lengths of 2 cm.

For each sample, a mass of 15g of the cut husk were measured.

30 grams of the binding agent (starch/red mud/polyvinyl alcohol) was mixed with 70 grams of water. This was then mixed with the fibers

The fiber binder mixture was packed into the pipes horizontally, secured with zip ties and compressed with a G-clamp.

The pipes with the wet samples were then placed in an electric oven at 120 °C for 5 hours. Removed allowed to cool then cut to 104 mm and weighed.

This was repeated for the various design runs. Note each sample must have 100-gram mixture.

Water Absorption test

Each sample was cut in half then weighed.

150 ml of water was measured in a beaker.

Each sample was submerged in the beaker of water for 1 day.

The apparatus was covered with paraffin paper.

The volume of the water absorbed was then measured.

Thermal Conductivity testing

7mm distances were measured, marked on the sample and holes half –way through were drilled. The remaining distance was evenly split, and two more holes added.

The sample was placed in the apparatus and thermocouples placed in each of the of the holes made.

One end of the sample was heated to 120 °C, this was maintained for 30 minutes and the temperature at each thermocouple was taken.

The thermal conductivity was then calculated.

This was repeated for each of the various runs in the experimental design.

Flammability test

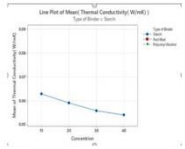
Each sample was cut in half then weighed.

Using a tong, each sample was held above a lit Bunsen burner for 1 minute.

The length of time each sample stayed aflame, and the extent of the damage was noted for each sample.

Results

The following graph shows the how varying thation of the binding agent affects the thermal conductivity of the samples created. It was observed that as the concentration of binding agent increased the thermal conductivity decreased i.e. an inversely proportional relationship.



The thermal conductivity of the samples ranges from 0.0533 to 0.0618 W/m-k using starch.

The thermal conductivity of the samples ranges from 0.0521 to 0.0637 W/m-k using polyvinyl alcohol.

The thermal conductivity range for these samples were higher than that of the samples made from starch. They ranged from 0.0637 to 0.0922W/m-k using red mud.

Conclusion

This research was a success. Based on the results obtained, jelly coconut husk is deemed fit as a thermal insulating material in the Jamaican construction sector. All samples produced relatively low thermal conductivities. However, the samples made from starch are the best overall. They produced a low thermal conductivity with a range of 0.0533 to 0.0618 W/m-k across the samples made. The starch samples also had an exceptionally low burning time which is less than two minutes. Also, of all the three samples the starch samples percentage mass increase range of (174 to 260%.) fell in the middle of the three samples. This project can help to minimize the waste produce from coconut, which will help the economy grow as well as sustaining the environment.

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".

BACHELOR OF ENGINEERING IN CHEMICAL ENGINEERING

PROGRAMME DESCRIPTION

The Chemical and Biological Engineering programme equips students with quality education in the theory and practice of chemical and biological engineering processes. The profession requires engineers to be able to apply the principles of the physical sciences and economics while considering environmental factors in the designs, implementation and operation of processes in which materials change their state, composition and/or energy content.

The programme, therefore, equips students with the necessary skills to research, develop, design and analyze chemical processes and equipment. The graduates of the B.Eng. (CHE) programme will also efficiently and safely design products to meet market specification with minimum negative impact on the environment.

This course of study is delivered in English and Spanish in order to adequately prepare graduates for effective careers in Latin American and the wider Caribbean Region. Written and spoken fluency in technical Spanish is achieved via a minimum of 18 credit hours in specialization modules taught in Spanish either at UTech, or at other accredited Spanish speaking universities

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-centred, 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.

CAREER OPPORTUNITIES

Graduates typically gain employment in the following areas in Jamaica: Petroleum refinery, Bauxite/Alumina Industry, Pharmaceutical industry, Sugar Refinery, Rum Distillery, Food Processing industries, Wastewater treatment plants, Chemical manufacturing.

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.

ENTRY REQUIREMENTS

Students are admitted to the programme on the basis of CSEC achievements and approved CAPE/A-Level studies beyond the fifth form level. Students will be admitted to the Bachelor of Engineering in Chemical Engineering programme on the basis of meeting **one** of the following criteria:

a) Five (5) CSEC/GCE ordinary level passes in English Language, Mathematics, Physics a, Chemistry and one (1) other (Technical or Science related) subject PLUS three (3) GCE A-level passes in Mathematics, Physics and Chemistry (an interview may be required for grades above C) OR Six (6) CAPE Units including Physics Units I and II, Mathematics Units I and II and Chemistry Units I and II (grades I, II and III preferred)

b) Successful completion of Year One of the Diploma in Electrical or Mechanical Engineering with a minimum GPA of 3.05

c) UTech Diploma in Engineering, or equivalent field of study (for Advanced Placement) with a minimum GPA of 2.7(an interview may be required)

d) Associate Degree in Engineering or equivalent field of study from an approved institution (for Advanced Placement) with a minimum GPA of 2.7 (an interview may be required).

PROGRAMME OBJECTIVES

Chemical engineers are expected to be adaptable enough to apply skills across many job descriptions as they can access varied career paths in process development, process control, production, environment, sustainability etc. These statements describe expected accomplishments of graduates during the first few years after graduation.

For Chemical Engineers, these objectives include (and are not limited to):

1. Apply knowledge of science, mathematics and economics to solve problems that confront society.
2. Design processes and equipment
3. Plan and test production methods
4. Scale up processes
5. Design and conduct experiments and analyze and interpret data collected so as to validate key Chemical Engineering theories and in doing so optimize processes
6. Function on multidisciplinary teams.
7. Communicate effectively at all levels using graphical, written and oral methods
8. Have an understanding of the professional and ethical responsibilities of an Engineer.
9. Critically assess the impact (environmental and otherwise) of engineering solutions in a global and societal context.
10. Use techniques, skills, computers and other contemporary engineering tools necessary for engineering practice.
11. Perform managerial functions (planning, organizing, coordinating, controlling, and supervising) during project execution, and to work efficiently with multidisciplinary teams.
12. Fulfill the academic requirements for engineering accreditation for membership in professional engineering organizations across Jamaica, the Caribbean region and also internationally.

COURSE STRUCTURE

YEAR [LEVEL]	PERIOD			MODULE CODE	MODULE TITLE	CREDIT HOURS	PRE-REQUISITE MODULE CODE (Indicate - P (Pass) OR T (Taken))
	S1	S2	Sum				
					Semester 1		
1	√	√	√	**COM1020**	**Academic Writing 1**	3	
1	√		√	**MAT2018**	**BEng Mathematics 1 - Calculus 1**	3	CAPE Math/MATH1059 [P]
1	√			PHS1005	Engineering Physics 1	4	CAPE Physics [P]
1	√			**CMP1003**	**Computers in Engineering**	4	
1	√			**ENG1009**	**Engineering Tools**	3	
1	√	√	√	CSP1001	Community Service Project	1	
						18	
					Semester 2		
1		√		ELE2210	Electrical Technology	3	
1		√		**CHE1001**	**Elementary Principles of Chemical Engineering**	4	ENG1009 [P]
1	√	√	√	**COM2014**	**Academic Writing 2**	3	COM1020 [P]
1		√		**MAT2022**	**BEng Mathematics 2 - Calculus 2**	3	MAT2018 [T]
1		√		ENG2008	Engineering Statics	3	
		√		ENG1006	Engineering Seminar	1	
1		√		LIB1001	Library Fundamentals	1	
						18	
					Semester 3		
2	√	√		**SPA1001**	**Spanish for Engineers 1**	3	
2	√		√	CHY2018	Physical Chemistry	4	
2	√		√	**MAT3004**	**BEng Mathematics 3- Differential Equations**	3	MAT2018[T]
2	√			CHY2026	Biochemistry	3	
2	√			CHY2027	Biochemistry Lab	1	
2	√			ENT3001	Entrepreneurial skills	3	
						17	
					Semester 4		
2		√		**SPA1002**	**Spanish for Engineers 2**	3	SPA1001 [P]
2		√		CHE3001	Unit Operations 3: Particle Technology	3	CHE1001 [P]
2		√		ENG3001	Material Science with corrosion	3	
2		√	√	CHY3022	Analytical Chemistry	4	CHY2018/CHY2026

COURSE STRUCTURE

YEAR (LEVEL)	PERIOD			MODULE CODE	MODULE TITLE	CREDIT HOURS	PRE-REQUISITE MODULE CODE (Indicate - P (Pass) OR T (Taken)
	S1	S2	Sum				
2		√		**STA2023**	**Engineering Statistics**	3	
2		√		**CHE3012**	**Unit Operations 2**	3	CHE1001 [T]
						19	
					Semester 5		
3	√			CHE3006	Chemical Reaction Engineering	3	CHE1001 [P]
3	√	√	√	ENG4016	Management for Engineers	3	
3	√			**CHE3003**	**Chemical Engineering Thermodynamics I**	3	CHE1001 [T]
3	√			**CHE3008**	**Unit Operations 5: Mass Transfer**	3	CHE1001 [P]
3	√			**CHE3004**	**Unit Operations 4: Heat Transfer**	3	CHE1001 [T]
3	√			CHE4022	Inorganic Chemical Technology	3	CHE1001 [P]
						18	
					Semester 6		
3		√		**SPA2007**	**Spanish for Engineers 3**	3	SPA1002[P]
3		√		CHE2003	Unit Operations Laboratory 1	1	CHE3001 [T], CHE3012 [T]
3		√		CHE2004	Chemical and Biological Process Principles	1	CHE1001 [P]
3		√		CHE2001	Unit Operations 1: Transport Phenomena	4	CHE1001 [T]
3		√		CHE3007	Chemical Engineering Thermodynamics II	3	CHE3003 [T]
3		√		CHE3005	Unit Operations Laboratory II	1	CHE3004 [P], CHE3008 [P]CHE3012 [P]
						13	
					Semester 7		
4	√			CHE4018	Wastewater Treatment	3	
4	√			SPA2006	Spanish for Engineers 4	1	SPA2007 [P]
4	√			CHE4003	Process Control & Dynamics 1	3	CMP1003 [P] MAT3004 [T]
4	√			**CHE4025**	**Chemical Engineering Plant Design & Economics I**	2	CHE3004[P], CHE3008[P]CHE3012[P]
4	√			**PRJ4029**	**Research Methods for Engineering Research**	3	STA2023[T], COM2014[P]
4	√			xxxx	University Elective	3	
						15	

COURSE STRUCTURE

YEAR [LEVEL]	PERIOD (Access Options)			MODULE CODE	MODULE TITLE	CREDIT HOURS	PRE-REQUISITE MODULE CODE (Indicate - P (Pass) OR T (Taken))
	S1	S2	Sum				
4		√		CHE4026	Chemical Engineering Plant Design & Economics II	2	CHE4025 [P]
4		√		CHE3002	Mathematical Modelling	3	
4		√		PRJ4030	Engineering Research Project	3	PRJ4029 [T]
4		√		CHE xxxx	Chemical Engineering Elective	3	
4		√		CHE xxxx	Chemical Engineering Elective	3	
						14	
	√	√	√	ENG4010	Industrial Experience	**2**	
					Total	**134**	

CHEMICAL ENGINEERING ELECTIVES

(TWO ARE TO BE SELECTED)

YEAR [LEVEL]	PERIOD			MODULE CODE	MODULE TITLE	CREDIT HOURS
	S1	S2	Sum			
4		√		CHE4016	Air Pollution Control*	3
4		√		CHE4019	Remediation Technology*	3
4		√		CHE4023	Polymer Science for Engineering	3

COURSES AND COURSE DESCRIPTION

MAT2018 B. Engineering Math 1 Credit value: 3

In this module students will be introduced to intermediate aspects of calculus. These include advanced optimization applications of differentiation using LaGrange multipliers, McLaurin'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.

PHS1005 Engineering Physics 1 Credit value: 4

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.

CMP1003 Computers in Engineering Credit value: 3

The purpose of this module is to introduce students, with **little or no programming** to provide students with an understanding of the role computation can play in solving problems. It also aims to help students, regardless of their major, to feel justifiably confident of their ability to write small programs that allow them to accomplish useful goals.

ENG1009 Engineering Tools Credit value: 3

The module exposes the student to engineering fundamentals and applications. It is intended to give entering students a view of what engineers do professionally. The module is designed with a theoretical and practical component. The theory includes: background and history of engineering, engineering team, engineering ethics, engineering analysis and design, technical communication and engineering calculations. The practical component includes electrical and mechanical workshop and engineering graphics and is geared towards preparing students for safe and effective engineering practices. The final practical component will introduce computer drafting packages such as AUTOCAD to demonstrate to the students how drafting software can be utilised in engineering design. The student will be exposed to various standards for engineering drawings.

CSP1001 Community Service Project **Credit value: 1**

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 CSP 1001.

ELE2210 Electrical Technology **Credit value: 3**

In this course 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.

CHE1001 Elementary Principles of Chemical Engineering **Credit value: 4**

This course introduces the students to the foundation of chemical engineering at the intermediate level. Topics include: the role Chemical Engineers, engineering calculations, process and process variables, fundamentals of material and energy balances, single phase systems, multi-phase systems, and energy balances in non-reactive.

COM2014 Academic Writing 2 **Credit value: 3**

The ***Academic Writing II*** module covers skills in critical thinking and reading, and problem solving competencies and demands the effective use of both receptive and expressive skills. The module is divided into four units: **The Concept of Critical Thinking, The Critical Thinking Process, Critically Evaluating Arguments** and **Writing the Argumentative Research Essay. A**ll three units are inter-related and the skills and competencies acquired in each are reinforced in the others.

MAT2022 B. Engineering Math 2 **Credit value: 3**

This module seeks to introduce students to engineering systems which 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.

ENG2008 Engineering Statics **Credit value: 3**

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.

ENG1006 Engineering Seminar **Credit value: 1**

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.

LIB1001 Library Fundamentals **Credit value: 1**

The module is designed to develop 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 whether it is found in books, journals or in multi-media.) that it exits.

SPA11001 Spanish for Engineers 1 **Credit value: 3**

This module introduces non-Spanish speakers to the basic functions and structures of Spanish, with application to the tasks and vocabulary required to communicate effectively in the area of Chemical Engineering. The four language skills of listening, speaking, reading and writing are emphasized, but greater emphasis will be placed on oral and listening skills.

CHY2018 Physical Chemistry **Credit value: 4**

This module is designed to make the concepts and methods of physical chemistry clear and interesting to students who have successfully completed the one-year PCS course in calculus, general Chemistry and Physics. The underlying theory of chemical phenomena is complicated and so it is the objective of this course to make the most important concepts and

methods understandable to undergraduate students. These basic ideas will be very useful to the students throughout their undergraduate studies and in the practice of their profession.

MAT3004 B. Engineering Math 3 Credit value: 3

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

CHY2026 Biochemistry Credit value: 3

This module elaborates on the basic concepts of Biochemistry. It involves details of the components of cells and the Biomolecules: Carbohydrates, Proteins, Lipids, Nucleic acids, Enzymes, Vitamins; their functions; and study of various metabolic processes. Industrial applications of processes are emphasized.

CHY2027 Biochemistry Laboratory Credit value: 1

This module is designed to develop and enhance the laboratory skills of students doing General Biochemistry. It also serves to complement and reinforce the theoretical aspects of the General Biochemistry module. The module introduces students to basic laboratory techniques and procedures used within the field of biochemistry. Students are therefore expected to master the skills taught in this module as well as correlate the experiments to the taught theories.

ENT3001 Entrepreneurial Skills Credit value: 3

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.

SPA1002 Spanish for Engineers 2 Credit value: 3

This module seeks to develop the students' fluency in the listening, speaking, reading and writing skills necessary for communication in Spanish in personal and professional situations related to Chemical Engineering. The four language skills of listening, speaking, reading and writing will continue to be developed. The module emphasizes oral and writing skills, and the acquisition of technical vocabulary required to function in the professional field of Chemical Engineering.

CHE3001 Unit Operations 3 (Particle Technology) Credit value: 3

This module covers the physical characteristics of particles and their influence on blending efficiency and separation techniques. Some focus will also be given to physical unit operations typically found in the chemical process industry, notably cyclones, crushers, filters and fluidized bed reactors. The design of select process equipment will also be addressed.

ENG3001 Material Science with Corrosion Credit value: 3

This module will outline the main aspects to consider in selecting a material that show high resistance corrosion with enough mechanical strength to carry out chemical or bio chemical processes and generate a product to fulfill a need.

CHY3022 Analytical Chemistry Credit value: 4

This is a lecture / laboratory course that provides an introduction to the major techniques that are used in the analysis of environmental; pharmaceutical; industrial and clinical samples. The module covers topics such as statistical treatment of data, sampling techniques, titrimetry, optical and atomic spectroscopy as well as chromatography. The laboratory component focuses on selected experiments that serve to reinforce those critical techniques covered in the theory.

STA2023 Engineering Statistics Credit value: 3

In this course students will be introduced to basic probability and statistics. Emphasis will be placed on areas that are important to experimental design and quality improvement. The practical applications to engineering will be highlighted.

CHE3012 Unit Operations 2 Credit value: 3

This module introduces the principles of fluid flow at the macroscopic level. Topics to be covered include: flow of fluids, flow and pressure measurements, flow in pipes, flow of compressible fluid, and pumping of fluids.

STA2023 Engineering Statistics Credit value: 3

In this course students will be introduced to basic probability and statistics. Emphasis will be placed on areas that are important to experimental design and quality improvement. The practical applications to engineering will be highlighted.

CHE3012 Unit Operations 2 Credit value: 3

This module introduces the principles of fluid flow at the macroscopic level. Topics to be covered include: flow of fluids, flow and pressure measurements, flow in pipes, flow of compressible fluid, and pumping of fluids.

CHE3006 Chemical Reaction Engineering Credit value: 3

This module is designed to give students a clear understanding of kinetics of homogeneous and heterogeneous reactions, rate laws and design of ideal reactors. Analysis of multiple reactions and rate data is carried out to support the design of industrial reactors.

ENG4016 Management for Engineers Credit value: 3

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

CHE3003 Chemical Engineering Thermodynamics I Credit value: 3

This module exposes students to the fundamental laws of thermodynamics and their application to issues frequently encountered in chemical processes. Students will be able to establish relationships between macroscopic properties of substances as well a make quantitative predictions relating to these properties.

CHE3008 Unit Operations 5 (Mass Transfer) Credit value: 3

This module introduces students to the fundamental concepts, principles and applications of mass transfer processes. The module covers mass transfer fundamentals such as diffusion, Fick's law and mass transfer coefficients, and the design of tray and packed columns. Separation processes covered in detail include.

CHE3004 Unit Operations 4 (Heat Transfer) Credit value: 3

The **U**nit operations IV module covers heat transfer and its application to chemical processes at the intermediate level. Students are exposed to equipment design, selection and specification for exploitation of the effects of the various modes of heat transmission.

CHE4022 Inorganic Chemical Technology Credit value: 3

This module covers industrial chemical technology at the advanced level in relation to production of inorganic acids, smelter grade alumina, ordinary Portland cement, distilled spirits and potable water. Topics include chemical process trouble shooting, technical problem solving and decision-making, as well as technical project.

SPA3006 Spanish for Engineers 3 Credit value: 1

This module seeks to develop the students' fluency in the listening, speaking, reading and writing skills necessary for communication in Spanish in personal and professional situations related to Chemical Engineering. The four language skills of listening, speaking, reading and writing will continue to be developed. The module emphasizes oral and writing skills, and the acquisition of technical vocabulary required to function in the professional field of Chemical Engineering.

CHE2003 Unit Operations Laboratory 1 Credit value: 1

This module provides practical experience in the areas of transport phenomena (rheology, transport coefficients), particle technology (size reduction, fluidization), mechanical separations (sedimentation and filtration) and fluid mechanics (pumping, flow measurement devices and channeling).

CHE2004 Chemical and Biological Principles Credit value: 1

This course introduces the students to industrial chemical processes and strategies to analyze them based on PFD, quality control, environmental management and production cost at the intermediated level. Topics include: process industry, process analysis, introduction to industrial safety engineering, and the impact on the environment. Processes are in relation to food, industrial raw materials and products which include sugar, production of inorganic acids, alumina, Portland cement, distilled spirits and potable water.

CHE2001 Unit Operations 1 (Transport Phenomena) Credit value: 4

This module covers the main aspects of momentum, energy and mass transfer in chemical processes at advanced level with emphasis on the following topics: general equations of transport phenomena, continuity equation, equations of change for isothermal systems at microscopic and macroscopic level.

CHE3007 Chemical Engineering Thermodynamics 2 Credit value: 3

In the Chemical Engineering Thermodynamics II module the students will consolidate the principles covered in Chemical Engineering Thermodynamics I via application to processes that include heat transfer, distillation, adsorption, absorption and extraction in order to cover the thermodynamic treatment of issues frequently encountered in industrial chemical processes.

CHE3005 Unit Operations Laboratory 2 Credit value: 1

This module covers the practical applications of the typical heat and mass transfer operations in the chemical processing industry at the intermediate level. It aims to complement lectures/tutorials taught in the Unit Operations IV & V modules. This approach will enhance the students' understanding of the application of the fundamental principles of these topics.

CHE4018 Wastewater Treatment Credit value: 3

This module covers the treatment of domestic wastewater at the advanced level. Topics include sources and effects, wastewater characterization and collection, primary, secondary and tertiary treatment as well as sludge stabilization and handling.

SPA2006 Spanish for Engineers 4 Credit value: 1

This module seeks to develop the students' fluency in the listening, speaking, reading and writing skills necessary for communication in Spanish in academic and professional presentations related to Chemical Engineering. The module emphasizes oral and writing skills, and the acquisition of technical vocabulary required to function in the professional field of Chemical Engineering.

CHE4003 Process Control and Dynamics 1 Credit value: 3

This module introduces important elements of dynamic process plant control at the intermediate level. Topics includes: Laplace transform, feedback and feed-forward control systems, process and instrumentation diagrams, reactive and non-reactive process modelling, frequency response analysis, plant analysis and design of control system and discrete response of dynamic systems.

CHE4025 Chemical Plant Design and Economics 1 Credit value: 2

This module introduces students to chemical process plant design and the integration of basic engineering principles in the overall designing of a process plant. Students participating in this module will focus on the topics: Introduction to process design; flowsheet synthesis and development; and health, safety and environmental issues.

PRJ4029 Research Methods for Engineering Research Credit value: 3

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 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.

CHE4026 Chemical Plant Design and Economics 2 Credit value: 2

This module prepares students for small scale plant and equipment design. Students will learn to apply the various engineering principles to design of a chemical plant to meet required design and cost specifications. The included topics are: equipment design and specification, process design economics and process optimization.

CHE3002 Mathematical Modelling Credit value: 3

This module introduces students to numerical methods, mathematical modelling and simulation at the intermediate level. Topics covered include: numerical solution of algebraic and ordinary differential equations, linear and non-linear regression and transport phenomena models. The module also makes use of the following software packages: MATLAB, Comsol Multiphysics and Microsoft Excel.

ENG 4010 Industrial Work Experience Credit value: 2

The industrial work experience will allow undergraduate engineering students to interact directly with practicing engineers in their specific technical environments. Emphasis will be placed on problem solving techniques and procedures as well as the understanding ethical and professional standards. Students will be exposed to trouble shooting and problem solving at the industrial level.

Chemical Engineering Elective Options

CHE4023 Polymer Science for Engineering Credit value: 3

This module introduces polymer science and technology which encompasses synthesis of polymers and elastomers, polymerisation techniques and processing methods. Polymer rheology, morphology, thermal and mechanical properties are discussed along with polymer applications and disposal methods.

CHE4019 Remediation Technology Credit value: 3

This module introduces students to the issues surrounding hazardous wastes, their generation and effects; and the remedial actions required to control the transport and disposal of contaminants in the environment. Topics include fundamentals of hazardous wastes management, management practices, treatment methods and site remediation.

CHE4016 Air Pollution Control Credit value: 3

This module is designed to provide students with an awareness of the issues surrounding industrial air pollution, its effects, and control strategies. Topics include: air pollution legislation and standards; air pollution measurement; atmospheric dispersion; prevention of air pollution; and air pollution control strategies.

PRJ4029 Major Project 1: Research Methods

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.

PRJ4030 Major Project 2: Design and Build

This module offers the students an opportunity to design and build solutions for realistic engineering problems that in turn provides learning opportunities that are student- centered.

NOTES

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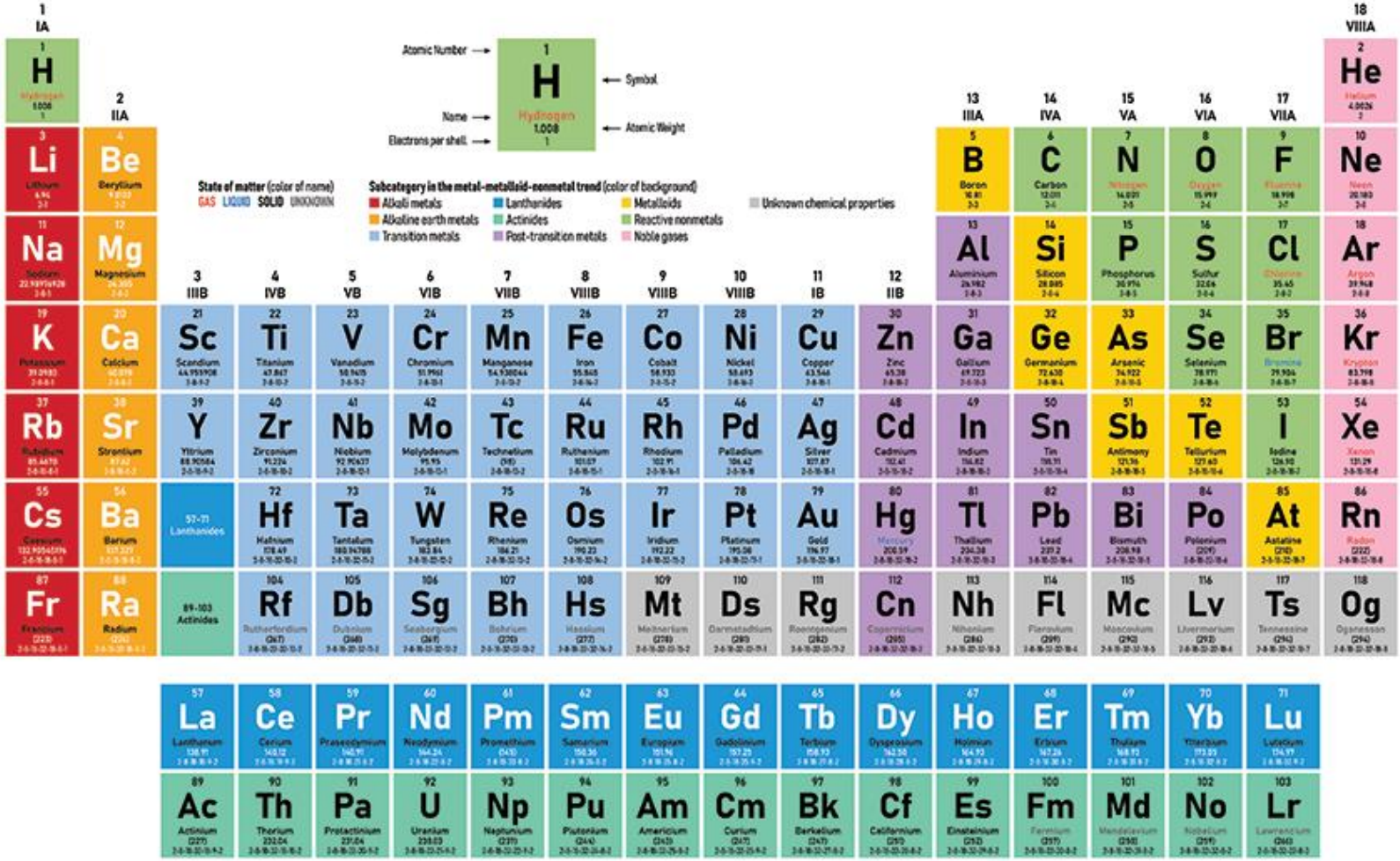
Periodic Table of the Elements



https://www.sciencenewsforstudents.org/article/scientists-say-periodic-table

The heights by great men reached and kept were not attained by sudden flight, but they, while their companions slept, were toiling upward in the night.

By: Henry Wadsworth Longfellow

Contact Info

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